# COMPUTER SERVICES INDUSTRY – 1977

INPUT

## ABOUT INPUT

Formed in 1974, INPUT has rapidly grown to become a leading business consulting company in the information processing industry. It specializes in market research, planning services, and special analyses for users and vendors of computer, and communications, and office products and services.

The company carries out continuous and in-depth research with vendors and users in the industry. Our staff analyze and interpret the complex and voluminous data derived from this research, based on their experience and the needs of clients. This information is presented concisely and understandably through reports and presentations. Useful recommendations and access to back-up data are strong points of our client relations.

INPUT's professional staff have, on average, nearly 20 years experience in the information processing industry. Most have had senior management experience in operations, marketing, or planni with unique strengths attested to by the the world's largest companies.

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# COMPUTER SERVICES INDUSTRY

## ANNUAL REPORT

NOVEMBER 1977

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# COMPUTER SERVICES INDUSTRY

# ANNUAL REPORT

# 1977

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# I. INTRODUCTION

# I INTRODUCTION

- This report is produced as part of the Market Analysis Service for the Computer Services Industry.

- The purpose of the report is to present trends and forecast developments in the computer services industry. These characteristics are described qualitatively, and their impact is reflected by computer services market size forecasts through 1982.

- The base year for forecasting is 1976.

- This report provides information on each type of computer service category covered:

  - Processing Services
    - General Business
    - Scientific and Engineering
    - Industry Specialty
    - Utility
  - Software Products
  - Professional Services

- It also addresses the mode of delivery of processing services:

  - Remote Computing Services
  - Batch Processing Services
  - Facilities Management

- Information is presented on each major industry sector:

    Discrete Manufacturing
    Process Manufacturing
    Transportation
    Utilities
    Banking and Finance
    Insurance
    Medical
    Education
    Retail
    Wholesale
    Federal Government
    State and Local Government
    Services
    Other Industries

  This information is of a summary nature; more detailed information is provided through the Industry Reports.

- This Annual Report provides updates on information published in previous Industry Reports and Impact Reports.

- The data on which this report is based come from:

    - Background information from about 750 personal and telephone interviews INPUT staff have carried out during the past year with computer and computer service users, and company executives.

    - Continuous contacts with computer service vendors during the past year, including over 500 formal interviews and 1000 direct contacts.

- The report is primarily an analysis of this data based on the experience and expertise of INPUT staff.

- This is the second Annual Report from the service. In the first year, the forecasting base was established for the commonly accepted services. This year's report concentrates on reordering and updating this data by user rather than vendor characteristics, and by the use to which services are put.

- Earlier this year, INPUT carried out a detailed evaluation of IBM's DB/DC (data base/data communications) software environment for this Annual Report:
  - Although detailed, it is included in its entirety in Section IV because of its importance.
  - IBM's DB/DC developments will have a fundamental impact on both processing and software services.
- Most of what was reported last year still applies and important observations and analyses are repeated.
- Changes in this year's report are:
  - Format has been changed for easy reading and identification of key points.
  - Emphasis has been placed on identifying user industry characteristics and activities of vendors by user industry.
  - Organization by mode of service (remote computing, batch, and facilities management) has been replaced by type of service.
  - Discussion of the issues affecting computer services is included in the client presentation and presentation volumes.
  - Analysis of competitors in the computer services industry is included in the report "Guide to the Computer Services Industry."
- Inquiries and comments from clients on the information presented are requested. Suggestions for changes in the structure or contents of this report are solicited.

# II. DEFINITIONS

## II DEFINITIONS

- **COMPUTER SERVICES**

These are services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

The following are definitions of the modes of service used in this report:

- **REMOTE COMPUTING SERVICES (RCS)**

Provision of data processing to a user by means of terminals at the user's site/s connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:

1. INTERACTIVE (timesharing) is characterized by interaction of the user with the system, primarily for problem solving timesharing, but also for data entry and transaction processing; the user is "on-line" to the program/files.

2. REMOTE BATCH is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.

3. DATA BASE is characterized by the retrieval of information from a vendor-maintained data base. This may be owned by the vendor or a third party.

- BATCH SERVICES

  This includes data processing performed at vendors' sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and COM processing, are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

- FACILITIES MANAGEMENT (FM)

  (Also referred to as "Resource Management" or "Systems Management"). The management of all or part of a user's data processing functions under a long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control as well as operate the facility provided to the user on-site, through communications lines, or in mixed mode. Simply providing resources, even though under a long-term contract and/or for all of a users' processing needs, does not necessarily qualify as FM.

- PROFESSIONAL SERVICES

  Management consulting related to EDP, systems consulting, systems design and programming, and other professional services are included in this category. Services can be provided on a basis of: "Time and Materials," whereby the user pays for the time used of an individual on a daily or other fixed rate, or "Fixed Price," where the user pays a fixed fee for a specific task or series of tasks.

- SOFTWARE PRODUCTS

  This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. The two sub-categories are:

1. SYSTEMS PACKAGES are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.

2. APPLICATIONS PACKAGES are software which perform processing to serve user functions. They consist of general purpose packages, such as for accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.

- **PROCESSING SERVICES**

Processing services encompass FM, RCS, and batch services: they are categorized by type of service, as distinguished from mode of service, bought by users as follows:

- GENERAL BUSINESS services are processing services for applications which are common to users across industry categories. Software is provided by the vendor; this can be a complete package, such as a payroll package, or an application "tool," such as a budgeting model, where a user provides much of the customizing of the finished product it uses. General business processing is often repetitive and transaction oriented.

- SCIENTIFIC AND ENGINEERING services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is nonrepetitive, except in the sense that the same packages or "tools" are used to address different, but similar, problems.

- INDUSTRY SPECIALTY services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an application "tool" which the user employs to produce its unique solution. Specialty applications can be either business or scientific in orientation; data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry specialty applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.

- UTILITY services are those where the vendor provides access to a computer and/or communications network with basic software that enables any user to develop its own problem solution or processing system. These basic tools include terminal handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

- All expenditures and revenues addressed are "available" in that they are open for competition. "Captive" figures, which refer to expenditures by a user for services from a subsidiary company, such as Boeing Aircraft with Boeing Computer Services (BCS), are not included. They may be referred to when examining an individual "spin-off" vendor, such as BCS.

- When any questions arise as to the place to properly count certain user expenditures, INPUT addresses the questions from the user viewpoint and categorizes the expenditures according to the answer to the question "What does the user perceive it is buying?"

- User organizations are categorized by size according to their average monthly expenditures for computer mainframes or their service equivalents. The general characteristics of these categories are shown in Exhibit II-1.

EXHIBIT II-1

## DEFINITION OF USER ORGANIZATION SIZE GROUPS

| CHARACTERISTICS | SIZE GROUP | | | |
|---|---|---|---|---|
| | SMALL | MEDIUM | LARGE | VERY LARGE* |
| NUMBER OF ORGANIZATIONS WITH COMPUTERS | | | | |
| 1975 | 40,000 | 20,000 | 10,000 | 1,000 |
| 1981 | 100,000 | 40,000 | 15,000 | 1,200 |
| MONTHLY RENTAL OF COMPUTER EQUIPMENT | <$5,000 | $5,000-$20,000 | $20,000 $100,000 | >$100,000 |
| SIZE IN ANNUAL SALES OR EQUIVALENTS | <$20 MILLION | $20 MILLION-$100 MILLION | $100 MILLION-$300 MILLION | >$300 MILLION |
| PROPORTION OF TOTAL EDP INDUSTRY IN 1975 | 10% | 35% | 30% | 25% |

*INCLUDES THE FEDERAL GOVERNMENT AND ITS 6,000 INSTALLATIONS.

- A minicomputer for the purposes of this report is a non-general purpose computer which sells for less than $100,000.

- Small business computers are IBM System/32 and System/3, and their equivalents intended as general purpose, data processing, business computers.

- Industry sectors used in this report are defined in Exhibit II-2.

EXHIBIT II-2

## INDUSTRY SECTOR DEFINITIONS

| INDUSTRY SECTOR | INDUSTRY SIC | INDUSTRY NAME |
|---|---|---|
| DISCRETE MANUFACTURING | 23 | APPAREL |
| | 25 | FURNITURE |
| | 27 | PRINTING |
| | 31 | LEATHER |
| | 34 | METAL |
| | 35 | MACHINERY |
| | 36 | ELECTRONICS |
| | 37 | TRANSPORTATION |
| | 38 | SCIENTIFIC AND CONTROL INSTR. |
| | 39 | MISCELLANEOUS MANUFACTURING |
| PROCESS MANUFACTURING | 10 | METAL MINING |
| | 11 | ANTHRACITE MINING |
| | 12 | COAL MINING |
| | 13 | OIL AND GAS EXTRACTION |
| | 20 | FOOD PRODUCTS |
| | 21 | TOBACCO |
| | 22 | TEXTILE PRODUCTS |
| | 24 | LUMBER AND WOOD PRODUCTS |
| | 26 | PAPER PRODUCTS |
| | 28 | CHEMICALS |
| | 29 | PETROLEUM |
| | 30 | RUBBER AND PLASTICS |
| | 32 | STONE, GLASS, CLAY |
| | 33 | PRIMARY METALS |

EXHIBIT II-2 (CONT'D)

## INDUSTRY SECTOR DEFINITIONS

| INDUSTRY SECTOR | INDUSTRY SIC | INDUSTRY NAME |
|---|---|---|
| TRANSPORTATION | 40 | RAILROAD |
| | 41 | LOCAL TRANSIT |
| | 42 | MOTOR FREIGHT |
| | 43 | U.S. POSTAL SERVICE |
| | 44 | WATER TRANSPORTATION |
| | 45 | AIR |
| | 46 | PIPELINES |
| | 47 | TRANSPORTATION SERVICES |
| UTILITIES | 48 | COMMUNICATION |
| | 49 | ELECTRIC, GAS, AND SANITARY |
| BANKING AND FINANCE | 60 | BANKS |
| | 61 | CREDIT AGENCIES |
| | 62 | SECURITY AND COMMODITY BROKERS |
| | 67 | HOLDING AND INVESTMENT OFFICES |
| INSURANCE | 63 | INSURANCE (LIFE, HEALTH, ETC.) |
| | 64 | INSURANCE AGENTS |
| MEDICAL | 80 | HEALTH SERVICES |

EXHIBIT II-2 (CONT'D)

## INDUSTRY SECTOR DEFINITIONS

| INDUSTRY SECTOR | INDUSTRY SIC | INDUSTRY NAME |
|---|---|---|
| EDUCATION | 82 | EDUCATIONAL SERVICES |
| RETAIL | 52 | BUILDING MATERIALS, HARDWARE |
| | 53 | GENERAL MERCHANDISE |
| | 54 | FOOD |
| | 55 | AUTOMOTIVE AND GAS STATIONS |
| | 56 | APPAREL |
| | 57 | FURNITURE |
| | 58 | EATING AND DRINKING |
| | 59 | MISCELLANEOUS RETAIL |
| WHOLESALE | 50 | DURABLE GOODS |
| | 51 | NON-DURABLE GOODS |
| STATE AND LOCAL GOVERNMENT | 91-97 | AS APPROPRIATE |
| FEDERAL GOVERNMENT | 91-97 | AS APPROPRIATE |
| SERVICES | 73 | BUSINESS SERVICES |

EXHIBIT II-2 (CONT'D)

INDUSTRY SECTOR DEFINITIONS

| INDUSTRY SECTOR | INDUSTRY SIC | INDUSTRY NAME |
|---|---|---|
| OTHER INDUSTRIES | 01-09 | AGRICULTURE, FORESTRY, AND FISHING |
| | 15-17 | CONSTRUCTION |
| | 65 | REAL ESTATE |
| | 66 | COMBINATIONS OF REAL ESTATE, INSURANCE, LOANS, LAW OFFICES |
| | 70 | HOTELS, ROOMING HOUSES, CAMPS, AND OTHER LODGING PLACES |
| | 72 | PERSONAL SERVICES |
| | 75 | AUTOMOTIVE REPAIR, SERVICES, AND GARAGES |
| | 76 | MISCELLANEOUS REPAIR SERVICES |
| | 78 | MOTION PICTURES |
| | 79 | AMUSEMENT AND RECREATION SERVICES, EXCEPT MOTION PICTURES |
| | 83 | SOCIAL SERVICES |
| | 84 | MUSEUMS, ART GALLERIES, BOTANICAL AND ZOOLOGICAL GARDENS |
| | 86 | MEMBERSHIP ORGANIZATIONS |
| | 89 | MISCELLANEOUS SERVICES |

# III. EXECUTIVE SUMMARY

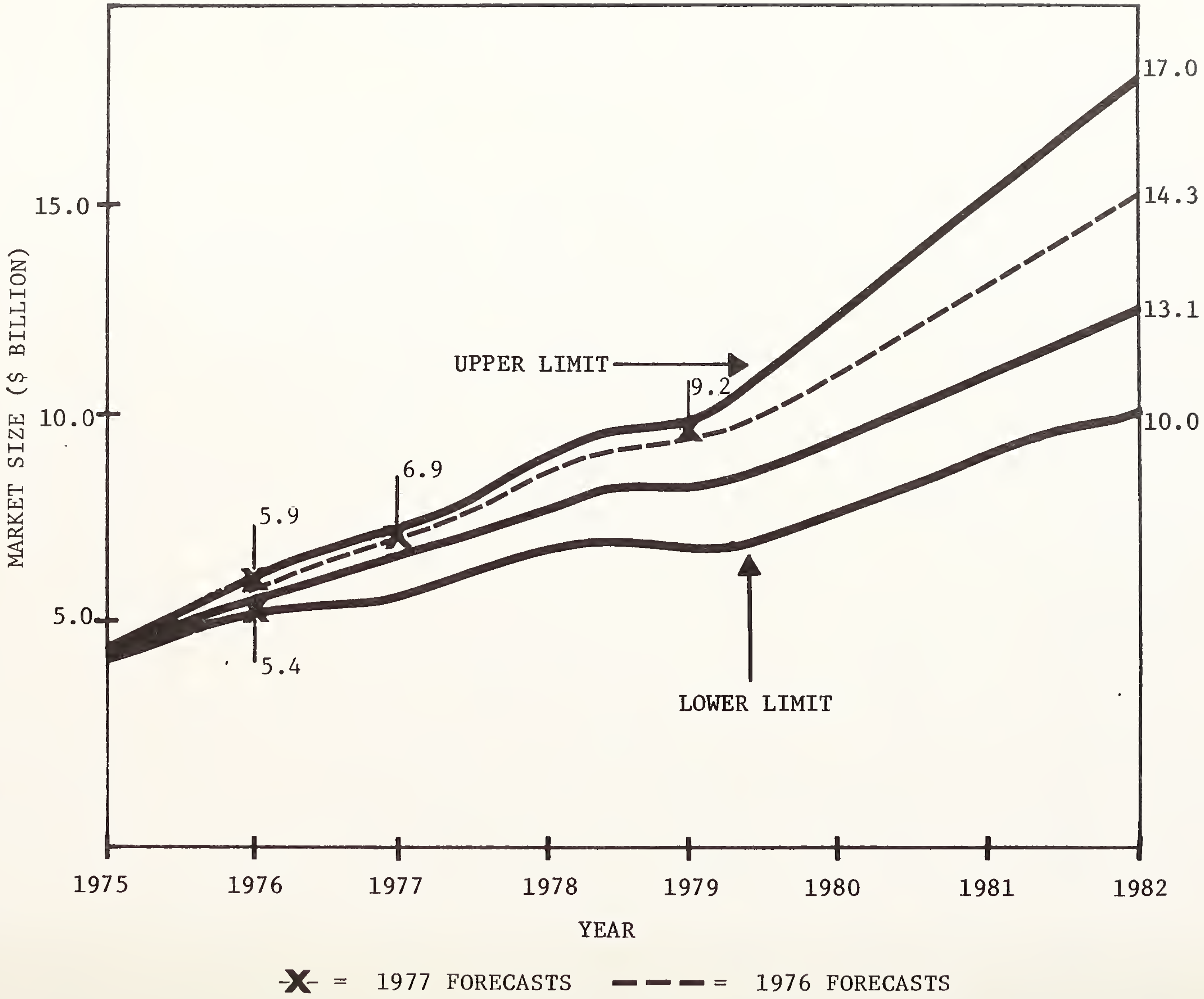
# III EXECUTIVE SUMMARY

## A. MARKET GROWTH

- In the 1976 Annual Report a forecast range was presented for computer services over the next 5 years:
    - As shown in Exhibit III-1, the forecast points have changed.
    - The "flattening" in 1978/1979 because of economic conditions will still take place.
- Factors affecting the forecast which will tend to increase market size:
    - IBM and/or AT&T entry into computer services market.
    - Complete software unbundling by IBM and other manufacturers.
    - In-house unionization of EDP.
    - Trend to use of computer services by federal government.
    - Increased regulation requiring more reporting and controls by business, industrial and other organizations.
    - Fast growing economy.

## EXHIBIT III-1

## POTENTIAL COMPUTER SERVICES MARKET GROWTH, 1976-1982



- Factors which will tend to decrease market size:

    - Regulation (privacy, in some cases, and FCC interfaces).

    - Static economy.

    - Increasing communications cost.

    - Conversion of processing services in-house through increased computer manufacturer facilities, tactics and pressure.

    - Price wars.

    - Lack of vendor response to rapidly changing market conditions.

- As computer services markets mature, growth rates will decline. However, new markets will constantly be opening, enabling the industry to maintain industry growth rate at 16%.

- Conversion of batch to remote computing services (RCS), growth of current marketing and opening of new markets will cause RCS to be the fastest growing mode of processing, as shown in Exhibit III-2.

- The fragmentation and lack of saturation of computer services markets is represented by the absolute growth of industry specialized markets, shown in Exhibit III-3.

    - Almost 60% of the processing services market growth is in industry specialized services.

- Utility processing services, which represent the problem solving, and custom application development and operation services will also contribute to the growth:

EXHIBIT III-2

COMPUTER SERVICES MARKETS GROWTH

RATES, 1976-1982

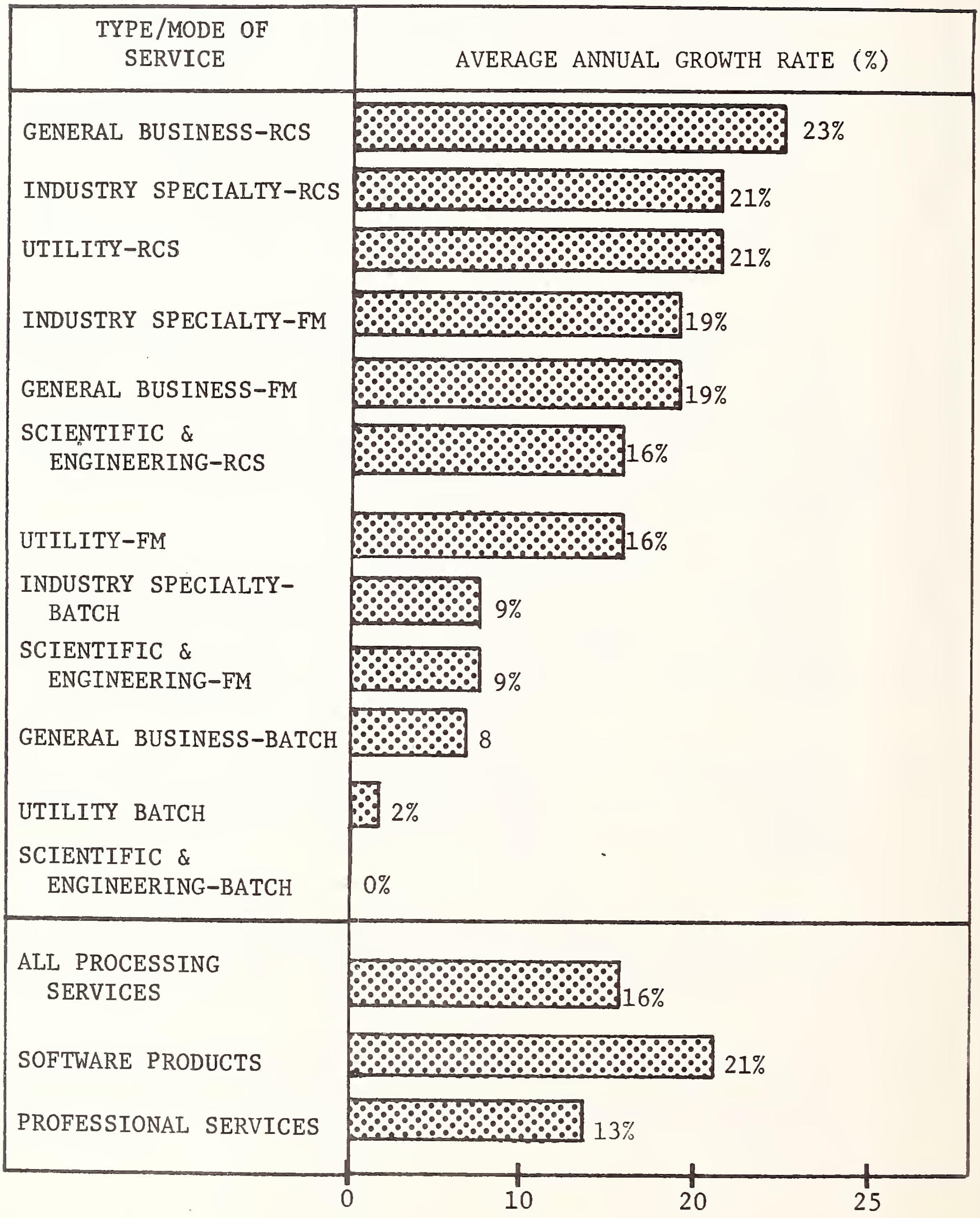
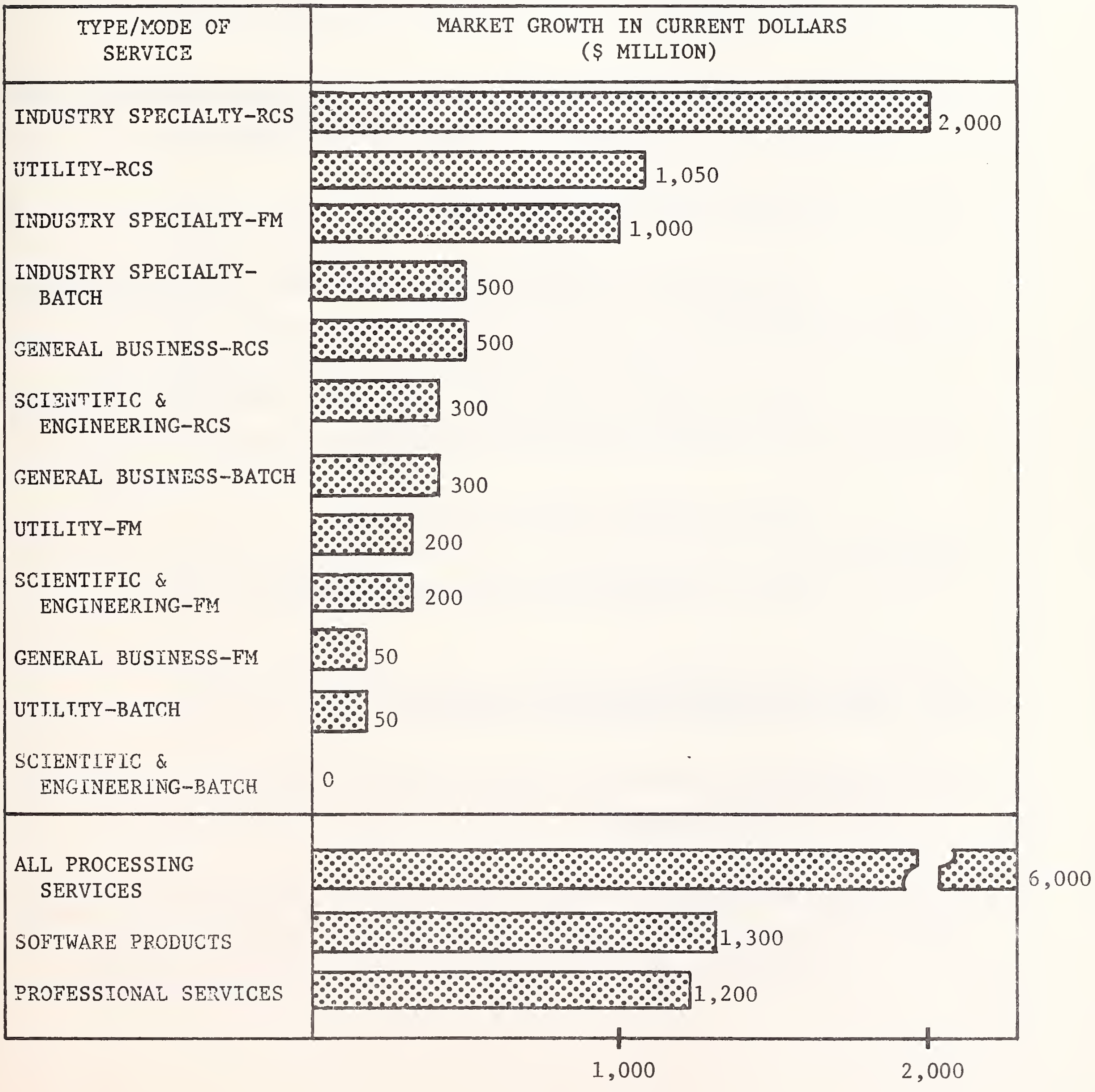


EXHIBIT III-3

## COMPUTER SERVICES MARKETS GROWTH, 1976-1982



  - Use of proprietary DBMS languages will enable applications software to be developed rapidly and effectively by vendors and users.

  - DBMS use is replacing that of COBOL, BASIC, and Assembler.

  - Professional services sales will increasingly be combined with RCS utility sales.

- Software products growth could be significantly higher depending on the actions of the major computers vendors, particularly IBM:

  - Inclusion of software in firmware.

  - Fragmentation of systems software into smaller units with charges for each unit.

  - IBM has doubled revenues from IMS in less than eighteen months by selling related products and enhancements.

  - Realistic pricing of software and hardware.

  - Series/I software costs more than the mainframe.

## B. ISSUES AFFECTING COMPUTER SERVICES

- Organizational issues affect computer services in the extent to which they open or close buying points:

  - Decentralization of profit center responsibility inhibits central control and distributed processing, while favoring stand-alone computer purchases (minicomputers and turnkey systems) and processing services.

  - Inclusion of communications, office processing and data processing in information services expands the scope for "computer" services sales.

- Demand by end users for EDP is increasing rapidly:

  - Number of non-technical (i.e., non-EDP trained) personnel on-line to computers is expected to grow by an order of magnitude by 1982.

  - Management is increasingly aware of the capabilities of EDP and is demanding faster applications development.

  - In-house EDP organizations are simply unable to cope with the increased demand.

- As a result, computer services vendors who have hitherto regarded the in-house EDP managers as implacable foes should sell to them.

- The word "computer" may well be dropped from computer services in the next five years:

  - Vendors will increasingly have to consider data processing integration with office/text processing and communications.

  - Vendors will expand into contiguous industries such as printing, education, insurance, information brokerage, etc.

- Increasingly, computer/communications networks operated by vendors must be regarded as delivery vehicles for software and vendor expertise.

- Requirements by users are more often computer/communications applications than just computer applications; this will affect all segments of the computer service market.

- Processing services vendors will have to deliver (not manufacture) hardware as part of industry specialized services, particularly to handle intra-site communications.

- Interface opportunities for software and services within an organization and between companies will increase very rapidly as the complexity of user requirements and vendor products increases.

- Increasing communications costs favor decentralized and distributed processing; decreasing costs of communications and hardware favor centralized processing:

    - Distributed data base software does not exist.

    - Control of distributed data bases will be extremely difficult and expensive.

    - Privacy and security may favor centralization and third party operations.

- Major hardware developments in next five years will be in input/output technology and memory:

    - Massive main memory with all data and programs resident will appear making inefficiences in operations of systems like IMS meaningless.

    - Output technology will revolutionize the printing business and function.

    - Storage will be cheaper electronically/magnetically than on paper by 1985.

    - Direct input systems involving digitizing rather than encoding will appear.

- Since many of these changes will start at the high (expensive) end, computer services companies will again have the opportunity of "resource sharing."

- Acquisitions in the computer services industry will increase in size and frequency:

  - While entry into the industry is relatively easy, successful expansion is becoming more and more difficult.

  - Large, successful companies are constantly looking for emerging companies and have the resources to evaluate their products or acquire them.

  - Continuing flow of new entrants, identification of embryonic successes, and consequent acquisition will contribute to the continuing flexibility and dynamism which make the computer services industry a success.

- Organizational issues within computer services are more likely to dampen than accelerate growth:

  - Recruiting, training, and retention of key people, especially in sales and marketing is a severe problem; turnover rates of 50% and more in sales staff are ridiculously inefficient.

  - Reorganization of sales, support, and development in view of the changing environment and need for industry specialization is required.

  - Pricing is a major concern to users and vendors; changes in philosophy and procedure are almost universally required.

  - Selection of, and planning for, new products and services in an environment where the market can change dramatically while development is taking place are difficult functions and increasingly risky.

  - Identification of the exact nature of future business is increasingly difficult.

- We will see more changes in the next five years in the computer/communications industries than in the last ten: that provides the challenges and opportunities for computer services.

## C. COMPETITIVE ENVIRONMENT

- IBM will become more aggressive in the software industry:

  - Will inhibit the growth of independent software required by users to meet their applications needs.

  - Will not enter the processing services markets directly after its agreement with CDC expires in January 1979.

  - Will enter certain markets, particularly the federal government processing market, if restrictions on hardware acquisition and internal EDP are enforced.

  - Will offer "hardware enhancement" or "software processing" services in the 1980s.

- AT&T will seek to use its telephone system for delivery of text and data handling:

  - If value added networks are deregulated it will move strongly into such services.

  - Bell has the nation's largest computer/communications network already in place.

  - Key question is for how much longer communications equipment will be banned from providing data processing services.

- By 1982, there will be several companies with $500 million or more in computer services:

  - These companies will be large enough to create new information services/product markets independent of the computer/communications suppliers.

  - They will put increasing pressure on the medium-sized ($20 million to $100 million in 1982) computer services companies so that consolidation in the industry will accelerate.

## D. RECOMMENDATIONS

- Computer services companies should treat their customer base as a very important asset:

  - Lost business and lost opportunity prevention programs should be installed and operated by vendors.

  - Vendors should research and plan products and services that can be profitably delivered to the exisiting client base, including ones which are not computer services.

- All types and sizes of computer services vendors should use their tools and technology to improve the management of their business:

  - Financial, marketing, and personnel systems should be among the finest used anywhere.

  - Major reason for the success of IBM and other vendors has been their concentration on systems for handling information effectively.

  - This does not mean the implementation of massive reporting systems which will "bog" people down in excessive paperwork.

- Industry specialization and changing technology require increased expenditures for R&D by computer services companies:

  - This must increase from the 1% or 2% of revenues currently spent to 5% or 6% or greater over the next five years, in order for vendors to continue to be successful.

  - Reliance on others to produce the software and special technology to facilitate market entry and protection will not be sufficient.

  - Small companies will not have the resources to develop many of the complex systems required in future.

- Industry selection and applications development, and even system software using DBMS as languages:

  - Rapidly develop a prototype system.

  - Market test it and modify it quickly and easily.

  - Don't worry unnecessarily about inefficiencies until clients are "up and running."

  - Then convert inefficient code, where necessary , to other languages for more efficient processing.

  - Provide customization, where necessary, for sales acceptance.

# IV. MARKET ANALYSIS

# IV MARKET ANALYSIS

## A. OVERALL COMPUTER SERVICES MARKET CHANGES

- Market forecasts represented in Exhibit IV-1 were derived from the "bottom-up":
    - In each of the 14 user industry sectors covered by INPUT, demographic data was prepared on the industries in that sector.
    - In each sector, processing services expenditures by users in each industry were projected by type and mode of service.
    - Data from interviews, last year's Annual Report and other CAMP and MAS surveys were introduced at this point.
    - Thus, figures were developed for 1975, 1976, 1981, and 1982 for each processing and software cell; for example,market figures for the remote computing general business services in 1976 in the process manufacturing industry sector cell were developed by examining expenditures in petroleum, food processing, drug, and other industries in this cell.
    - Forecasts were made at the "cell" level and aggregated to totals.

EXHIBIT IV-1

## COMPUTER SERVICES MARKET FORECAST, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 630 | $ 719 | 14% | $ 958 | $ 1,403 | 14% |
| SCIENTIFIC & ENGINEERING | 412 | 461 | 12 | 575 | 808 | 12 |
| INDUSTRY SPECIALTY | 2,236 | 2,602 | 16 | 3,573 | 5,716 | 17 |
| UTILITY | 959 | 1,113 | 16 | 1,491 | 2,252 | 15 |
| TOTAL PROCESSING | $4,237 | $4,895 | 16% | $6,597 | $10,179 | 16% |
| SOFTWARE PRODUCTS | 625 | 748 | 20 | 1,103 | 1,916 | 21 |
| PROFESSIONAL SERVICES | 1,050 | 1,217 | 16 | 1,545 | 2,225 | 13 |
| TOTAL | $5,912 | $6,860 | 16% | $9,245 | $14,320 | 16% |

($ MILLIONS)

- Vendor activity in each industry was examined to check for consistency with base market and forecast numbers.

- As a consequence of this method of building the forecasts, differences emerged in the base numbers and forecasts, as shown in Exhibit IV-2:

  - Detailed explanations of the differences are in Chapter VI, RECONCILIATION.

  - Although the overall growth rate remained the same, some significant differences were derived at disaggregated levels.

  - Some of these differences were due to increases in the base figures used in each industry sector.

  - INPUT research in specific industry sectors has found that previous figures used for market base are almost always conservative.

  - Thus, after Industry Reports are completed, market figures must be revised upward, usually by a relatively small, but significant amount.

- Major changes in this year's forecast:

  - Increase in current banking and finance market due to correspondent banking data processing market revision.

  - Increase in current retail market due to credit services market revision.

  - Increase in current medical market due to processing services market revision.

  - Reduction in growth rate in services industry sector due to revision of architect and engineering services market.

## EXHIBIT IV-2

## RECONCILIATION OF COMPUTER SERVICES FORECASTS BY INDUSTRY SECTOR BETWEEN 1976 AND 1977 ANNUAL REPORT

| INDUSTRY SECTOR | 1976 FORECAST OF 1976 MARKET | 1977 REPORT OF 1976 MARKET | 1976 FORECAST OF 1981 EXTENDED FOR 1982 MARKET | 1977 FORECAST OF 1982 MARKET | AAGR FORECAST IN 1976 REPORT | AAGR FORECAST IN 1977 REPORT |
|---|---|---|---|---|---|---|
| DISCRETE | $ 761 | $ 770 | $ 1,821 | $ 1,860 | 16% | 16% |
| PROCESS | 460 | 452 | 1,037 | 1,030 | 14 | 15 |
| TRANSPORTATION | 143 | 145 | 369 | 360 | 17 | 16 |
| UTILITIES | 242 | 242 | 528 | 530 | 14 | 14 |
| BANKING AND FINANCE | 954 | 1,145 | 2,305 | 2,840 | 17 | 17 |
| INSURANCE | 389 | 417 | 795 | 970 | 12 | 15 |
| MEDICAL | 270 | 365 | 720 | 885 | 18 | 16 |
| EDUCATION | 117 | 115 | 251 | 250 | 14 | 14 |
| RETAIL | 255 | 375 | 667 | 950 | 17 | 17 |
| WHOLESALE | 377 | 380 | 809 | 830 | 14 | 14 |
| FEDERAL GOVERNMENT | 700 | 730 | 1,898 | 1,880 | 17 | 17 |
| STATE AND LOCAL | 226 | 230 | 579 | 570 | 17 | 16 |
| SERVICES | 257 | 261 | 793 | 715 | 21 | 18 |
| OTHER | 249 | 285 | 559 | 650 | 14 | 14 |
| TOTAL | $5,400 | $5,912 | $13,120 | $14,320 | 16% | 16% |

($ MILLION)

- Increase in insurance market growth rate due to revision of growth for government funded health insurance data processing, including Medicaid, Medicare, and National Health Insurance.

- Decrease in growth rate in medical due to increased penetration represented by change in base numbers.

- Within each industry sector there are usually slow and fast growth components of computer services use:

  - Also many processing and software products and services are transferable across industry.

  - Therefore, industry sector growth rates tend to cluster around the average of 16%, as shown in Exhibit IV-3.

## B. GENERAL BUSINESS PROCESSING SERVICES

- Manufacturing and distribution account for nearly 70% of this market, as shown in Exhibit IV-4.

- Particular opportunity for RCS in this market is that of human resources systems:

  - Benefits packages are increasingly complex.

  - Pension plans and retirement benefits liabilities are a severe problem for even very large companies.

  - Management and reporting requirements are increasing.

EXHIBIT IV-3

COMPUTER SERVICES

MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 770 | $ 890 | 16% | $1,205 | $ 1,860 | 16% |
| PROCESS MANUFACTURING | 452 | 510 | 13 | 665 | 1,030 | 15 |
| TRANSPORTATION | 145 | 169 | 17 | 225 | 360 | 16 |
| UTILITIES | 242 | 275 | 14 | 370 | 530 | 14 |
| BANKING AND FINANCE | 1,145 | 1,330 | 16 | 1,805 | 2,840 | 17 |
| INSURANCE | 417 | 480 | 13 | 655 | 970 | 15 |
| MEDICAL | 365 | 430 | 18 | 580 | 885 | 16 |
| EDUCATION | 115 | 132 | 15 | 175 | 250 | 14 |
| RETAIL | 375 | 440 | 17 | 600 | 950 | 17 |
| WHOLESALE | 380 | 425 | 15 | 545 | 830 | 14 |
| FEDERAL GOVERNMENT | 730 | 885 | 21 | 1,205 | 1,880 | 17 |
| STATE & LOCAL GOVERNMENT | 230 | 265 | 15 | 360 | 570 | 16 |
| SERVICES | 261 | 306 | 17 | 435 | 715 | 18 |
| OTHER | 285 | 323 | 13 | 420 | 650 | 14 |
| TOTAL | $5,912 | $6,660 | 16% | $9,245 | $14,320 | 16% |

($ MILLIONS)

EXHIBIT IV-4

## GENERAL BUSINESS PROCESSING SERVICES MARKET

## FORECAST, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $172 | $195 | 13% | $270 | $ 365 | 13% |
| PROCESS MANUFACTURING | 66 | 75 | 14 | 97 | 143 | 14 |
| TRANSPORTATION | 17 | 20 | 18 | 27 | 43 | 17 |
| UTILITIES | 12 | 14 | 15 | 20 | 30 | 17 |
| BANKING AND FINANCE | 26 | 31 | 22 | 45 | 80 | 21 |
| INSURANCE | 15 | 18 | 20 | 25 | 42 | 19 |
| MEDICAL | 20 | 23 | 15 | 29 | 40 | 12 |
| EDUCATION | 12 | 14 | 15 | 20 | 32 | 18 |
| RETAIL | 65 | 75 | 15 | 90 | 115 | 10 |
| WHOLESALE | 128 | 140 | 10 | 175 | 249 | 12 |
| FEDERAL GOVERNMENT | 15 | 18 | 20 | 26 | 45 | 20 |
| STATE & LOCAL GOVERNMENT | 13 | 16 | 20 | 25 | 45 | 23 |
| SERVICES | 16 | 20 | 25 | 30 | 60 | 26 |
| OTHER | 53 | 60 | 14 | 79 | 114 | 14 |
| TOTAL | $630 | $719 | 14% | $958 | $1,403 | 14% |

($ MILLIONS)

- Government regulation will force companies to control this activity better even when actual operations of such plans are contracted to third parties, such as banks and insurance companies.

- Medical, education, insurance, and other benefits packages are becoming a large part of employee renumeration.

- Management and reporting (for the company, managers, employees, and regulators) are becoming more complex and time dependent.

- Regulation by EEOC, DOL, SEC, IRS, and other federal and state agencies is becoming more restrictive and reporting requirements more onerous.

- This application generally applies to all organizations without regard to industry or company size.

- Accounting applications are increasingly moving on-line, at least for data-entry:

  - Cheaper terminals are lowering the threshold for use of RCS.

  - Small business computers are the competition particularly for single site, static companies.

- Financial applications for medium and large companies with distributed small establishments are also a major opportunity:

  - Cash management services are a major target for banks.

  - Tax calculation and tax planning services will continue to grow rapidly (over 20% per year).

  - Tax planning is primarily an RCS opportunity while batch mode is still satisfactory for most accountants for calculation.

- Administrative opportunities involving the integration of communications with data and text processing will increase most rapidly:

  - Internal mail.

  - Inter-company mail routing.

  - Telephone directory maintenance.

  - Administrative inventories including personnel skills inventory.

  - Patent and legal data base.

  - Corporate policy and procedure data bases.

- Marketing and sales support applications include:

  - Market research questionnaire analysis and market forecasting.

  - Sales call reporting systems.

  - Mail and other merchandising planning, execution and control.

  - Sales prospect identification systems and in the specialty area, data bases.

## C. SCIENTIFIC AND ENGINEERING PROCESSING SERVICES

- This market will almost double by 1982, as shown in Exhibit IV-5:
  - Penetration of EDP use to engineers is still less than 50%.
  - Potential efficiencies and improvements in product resulting from the use of EDP will cause this penetration to improve markedly over the next five years.
  - Processing services will be the means for achieving this penetration in small and medium organizations.
- The Federal Government market growth may be considerably understated if in-house EDP continues to be down-graded.
- Also, construction industry and architect and engineering expenditures will be considerably higher if capital investment and construction continues at the present pace.
- Even with the movement of processing in-house to both large and small computers, external services will continue to be used for development, testing, and running of infrequently used applications.
- The major growth area will continue to be structural analysis:
  - "Push-down" to smaller companies will be possible.
  - New software will be developed.
  - Integration of graphics with structural analysis will expand.

EXHIBIT IV-5

## SCIENTIFIC AND ENGINEERING PROCESSING SERVICES

## MARKET FORECAST, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 59 | $ 65 | 10% | $ 79 | $130 | 14% |
| PROCESS MANUFACTURING | 37 | 40 | 8 | 50 | 73 | 12 |
| TRANSPORTATION | 5 | 5 | 0 | 5 | 5 | 0 |
| UTILITIES | 48 | 55 | 15 | 70 | 90 | 11 |
| BANKING AND FINANCE | - | - | - | - | - | - |
| INSURANCE | - | - | - | - | - | - |
| MEDICAL | 1 | 1 | 10 | 3 | 5 | 31 |
| EDUCATION | 8 | 8 | 5 | 10 | 13 | 8 |
| RETAIL | - | - | - | - | - | - |
| WHOLESALE | - | - | - | - | - | - |
| FEDERAL GOVERNMENT | 144 | 160 | 11 | 194 | 255 | 10 |
| STATE & LOCAL GOVERNMENT | 3 | 4 | 30 | 8 | 18 | 35 |
| SERVICES | 72 | 83 | 15 | 105 | 143 | 12 |
| OTHER | 35 | 40 | 14 | 51 | 76 | 14 |
| TOTAL | $412 | $461 | 12% | $575 | $808 | 12% |

($ MILLIONS)

- Biological, biochemical and related sciences will again be an opportunity for RCS.

- Simulation activity will increase.

- Scientific and engineering processing which is specialized by industry, such as seismic data collection in the petroleum industry, is included in industry specialty forecasts:

    - This market will grow faster than the general market.

    - One reason for the relatively slow market growth and lack of interest by many computer services vendors is that most software is easily available; thus, sales are made on a "commodity" or "support" basis.

    - "Commodity" sales are cheap while "support" is expensive to provide and frequently not needed by customers.

- Vendors must provide proprietary software, even if it is only in the interface or front-end area, as CDC has successfully done.

## D. INDUSTRY SPECIALTY PROCESSING SERVICES

- Industry specialized processing services, including data bases, form the largest and fastest growing of the processing services:

    - Over 35% of the market is in the banking and finance sector and this will continue to be the single largest component, as shown in Exhibit IV-6.

    - Growth in the utilities industry reflects a transfer from utility processing as RCS vendors become more specialized in this area, and regulating problems increase.

EXHIBIT IV-6

## INDUSTRY SPECIALTY PROCESSING SERVICES

## MARKET FORECAST, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 153 | $ 185 | 21% | $ 265 | $ 440 | 19% |
| PROCESS MANUFACTURING | 97 | 115 | 19 | 160 | 272 | 19 |
| TRANSPORTATION | 55 | 65 | 18 | 95 | 167 | 20 |
| UTILITIES | 32 | 40 | 25 | 65 | 130 | 27 |
| BANKING AND FINANCE | 805 | 925 | 15 | 1,250 | 2,000 | 17 |
| INSURANCE | 253 | 290 | 15 | 385 | 553 | 14 |
| MEDICAL | 280 | 330 | 18 | 440 | 660 | 15 |
| EDUCATION | 28 | 34 | 20 | 48 | 78 | 19 |
| RETAIL | 210 | 250 | 20 | 350 | 540 | 17 |
| WHOLESALE | 98 | 110 | 13 | 145 | 229 | 15 |
| FEDERAL GOVERNMENT | 12 | 14 | 17 | 20 | 35 | 20 |
| STATE & LOCAL GOVERNMENT | 13 | 16 | 25 | 30 | 70 | 32 |
| SERVICES | 113 | 132 | 20 | 200 | 350 | 21 |
| OTHER | 87 | 96 | 10 | 120 | 192 | 14 |
| TOTAL | $2,236 | $2,602 | 16% | $3,573 | $5,716 | 17% |

($ MILLIONS)

- There are a wide range of specialties with few being saturated:
  - Even stock quotation data base services, which have appeared saturated for several years, are expanding to other areas in brokerage and banking.
- Almost 70% of facilities management contracts require industry specialized software and services: most of the remainder is in the federal government.
- Of the major industry specialties:
  - Correspondent bank data processing, at $380 million, is presently the largest such specialty.
  - Econometric and financial data bases account for $200 million in 1976 revenues which will expand to $500 million by 1982.
  - Credit, a related data base service, is already at $150 million and will also increase rapidly through 1982.
  - Hospital and clinic processing is over $200 million in 1976.
- Data base related markets will expand rapidly in a variety of areas:
  - Financial and econometric, and credit, as mentioned above.
  - Scientific and engineering.
  - Legal and regulatory.
  - Demographic.
  - News data bases, both general and specialized.
  - Other text data bases.

- Total data bases market of all kinds will be a multi-billion dollar business in the 1980s. RCS will be a major delivery vehicle.

## E. UTILITY PROCESSING SERVICES MARKET

- This is the application of vendor resources in terms of people, software, networks, computers, and other data processing equipment to the solution of user problems on a singular basis:
  - Users may simply purchase access to the vendor facilities to develop solutions or perform processing using their own software.
  - Alternatively, vendors may assist users in the development of these solutions.
- The main component of the growth of this market to a $1.5 billion per year business in 1982 is the acceptance of the advanced data base management systems being offered by the RCS vendors:
  - Proprietary DBMS software packages such as NOMAD, MAGNUM, FOCUS, and RAMIS are being used as languages by vendors and users alike.
  - Use results in rapid development of applications which are easy to use.
  - A major factor in the growth of use of such languages is the 10-fold projected increase in the use of vendor services by non-technical (in an EDP sense) people.
- DBMS services being offered are generalized and specialized:

  - Vendors generally offer, or will offer, several DBMS languages to provide tailoring of languages to user need.

  - For example, simple financial applications will be developed using one type of DBMS while a complex market planning model to be used by a sophisticated user will be developed using another.

  - By 1982, 75% of the utility market processing will be through the use of such DBMS.

- Sources of DBMS used by RCS vendors will vary:

  - Proprietary DBMS will be developed by RCS vendors themselves, as with National CSS' NOMAD.

  - Other proprietary software will be commissioned by RCS vendors as ADP Network Services did.

  - Independent suppliers of DBMS, such as MRI Systems and Software A.G.

  - Computer manufacturers, notably IBM and DEC.

- As shown in Exhibit IV-7, the federal government will be the fastest growing user of utility services:

  - Specialized marketing and sales are needed more to this industry than most others.

  - Singularity of needs and desire for vendor independence will mean utility services grow at the expense of other types of processing.

  - Since contracts must be rebid periodically, proprietary software will be avoided; this is one reason for the success of System 2000 in the federal government and vendors which serve it.

EXHIBIT IV-7

## UTILITY PROCESSING SERVICES MARKET

## FORECAST, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 96 | $ 105 | 9% | $ 131 | $ 175 | 11% |
| PROCESS MANUFACTURING | 85 | 100 | 16 | 128 | 177 | 13 |
| TRANSPORTATION | 22 | 25 | 15 | 33 | 45 | 12 |
| UTILITIES | 73 | 81 | 11 | 105 | 130 | 10 |
| BANKING AND FINANCE | 94 | 114 | 21 | 155 | 220 | 16 |
| INSURANCE | 37 | 42 | 14 | 55 | 80 | 14 |
| MEDICAL | 9 | 11 | 20 | 13 | 20 | 14 |
| EDUCATION | 18 | 20 | 10 | 29 | 27 | 7 |
| RETAIL | 40 | 45 | 12 | 55 | 75 | 11 |
| WHOLESALE | 82 | 90 | 10 | 105 | 136 | 9 |
| FEDERAL GOVERNMENT | 264 | 318 | 20 | 465 | 825 | 21 |
| STATE & LOCAL GOVERNMENT | 61 | 70 | 15 | 92 | 137 | 14 |
| SERVICES | 33 | 40 | 20 | 55 | 92 | 18 |
| OTHER | 45 | 52 | 15 | 70 | 113 | 17 |
| TOTAL | $959 | $1,113 | 16% | $1,491 | $2,252 | 15% |

($ MILLIONS)

- Other utility services will also grow rapidly:
    - Micrographics services are already used by many banks and insurance companies.
    - New developments in graphics, storage, and input/output will make resource sharing devices attractive to medium and small users which otherwise could not afford them.

## F. TOTAL PROCESSING SERVICES MARKET FORECASTS

- Another way of examining the processing services market shown in Exhibit IV-8 is by mode of service - remote computing, facilities management, and batch. Differentiation among these modes is increasingly difficult.

- Overall, the government processing services market will grow the fastest:
    - State and local government is more fragmented, less sophisticated, and more difficult to sell to than the federal government.
    - However, pressures by the federal government, public and industry will make state and local governments far more responsive.

- Processing services markets to the professional services market, including accountants, lawyers, and architects and engineers, will expand rapidly due to:
    - Specialized services such as tax form preparation whose costs are "passed through" to clients.
    - Competitive pressures for automation from inside and outside the industries.

EXHIBIT IV-8

## PROCESSING SERVICES MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 480 | $ 550 | 15% | $ 745 | $ 1,110 | 15% |
| PROCESS MANUFACTURING | 285 | 330 | 15 | 435 | 665 | 15 |
| TRANSPORTATION | 99 | 115 | 16 | 160 | 260 | 17 |
| UTILITIES | 165 | 190 | 15 | 260 | 380 | 15 |
| BANKING AND FINANCE | 925 | 1,070 | 16 | 1,450 | 2,300 | 17 |
| INSURANCE | 305 | 350 | 15 | 465 | 675 | 14 |
| MEDICAL | 310 | 365 | 18 | 485 | 725 | 15 |
| EDUCATION | 66 | 76 | 15 | 107 | 150 | 15 |
| RETAIL | 315 | 370 | 17 | 495 | 730 | 15 |
| WHOLESALE | 308 | 340 | 10 | 425 | 614 | 12 |
| FEDERAL GOVERNMENT | 435 | 510 | 17 | 705 | 1,160 | 18 |
| STATE & LOCAL GOVERNMENT | 90 | 106 | 18 | 155 | 270 | 21 |
| SERVICES | 234 | 275 | 18 | 390 | 645 | 18 |
| OTHER | 220 | 248 | 13 | 320 | 495 | 14 |
| TOTAL | $4,237 | $4,895 | 16% | $6,597 | $10,179 | 16% |

($ MILLIONS)

- As shown in Exhibit IV-9, RCS in the general business applications area will be the fastest growing of the computer services:
  - Conversion of batch general business to RCS.
  - Increasing use of RCS for payroll and other standard accounting services by multi-establishment corporations.
  - Cash management services.
  - Human resources services.
  - Administrative and text services.
- RCS growth in industry specialty processing is projected to be lower than in last year's report:
  - Better definition of current market.
  - Base of business has been increased by slower growing services.
  - Examination of the nature of this business has shown industry sales to be longer and harder than projected.

## G. REMOTE COMPUTING SERVICES

- RCS is being impacted by hardware at all levels from very large to very small processors, as shown in Exhibit IV-10:
  - In-house "timesharing" is spreading through major companies using dedicated and shared processors.

EXHIBIT IV-9

COMPUTER SERVICES MARKET

FORECASTS BY MODE AND TYPE OF SERVICE,

1976-1982

| TYPE OF SERVICE | USER EXPENDITURES ($ MILLIONS) BY MODE OF SERVICE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | REMOTE COMPUTING SERVICES | | | FACILITIES MGMT. | | | BATCH | | | TOTAL | | |
| | 1976 | 1982 | AAGR | 1976 | 1982 | AAGR | 1976 | 1982 | AAGR | 1976 | 1982 | AAGR |
| GENERAL BUSINESS | $ 188 | $ 656 | 23% | $ 17 | $ 49 | 19% | $ 427 | $ 698 | 8% | $ 630 | $ 1,400 | 14% |
| SCIENTIFIC AND ENGINEERING | 225 | 551 | 16 | 107 | 181 | 9 | 80 | 76 | (0.4) | 410 | 810 | 12 |
| INDUSTRY SPECIALTY | 937 | 2,935 | 21 | 542 | 1,538 | 19 | 757 | 1,243 | 9 | 2,240 | 5,720 | 17 |
| UTILITY | 495 | 1,540 | 21 | 145 | 357 | 16 | 314 | 355 | 2 | 960 | 2,250 | 15% |
| TOTAL PROCESSING SERVICES (ROUNDED) | $1,845 | $5,680 | 21% | $ 810 | $2,125 | 17% | $1,580 | $2,370 | 7% | $4,240 | $10,180 | 16% |
| SOFTWARE PRODUCTS | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | 625 | 1,915 | 21 |
| PROFESSIONAL SERVICES | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | 1,050 | 2,225 | 13 |
| TOTAL COMPUTER SERVICES (ROUNDED) | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | $5,910 | $14,320 | 16% |

EXHIBIT IV-10

## COMPETITION TO REMOTE COMPUTING SERVICES

| LOCATION<br>APPLICATION | SINGLE ESTABLISHMENT | MULTI-ESTABLISHMENT |
|---|---|---|
| SINGLE USER | • DESK TOP COMPUTER<br>• CALCULATOR (PARTICULARLY FOR TRAVELERS) | ▨ |
| MULTI-USER | • MINICOMPUTER (SMALL ESTABLISHEMNTS<br>• LARGE COMPUTER (CENTRAL ESTABLISHMENT OF LARGE ENTERPRISE) | • CENTRAL, LARGE COMPUTER:<br>- NETWORKED FOR SMALL ESTABLISHMENTS OF LARGE ENTERPRISE<br>- ON-SITE FOR LARGE ESTABLISHMENTS |

- Upgraded TSO and software systems such as VSPC from IBM provide in-house groups with a service facility, particularly in large, central establishments.

- DEC has been strongly selling its DEC 10 and 20 computers to large RCS customers.

- "Timesharing" minicomputers will provide local interactive support for problem solving in multi-user, single location.

- Turnkey systems are being used for many stand-alone business applications processing in decentralized small establishments.

- Programmable calculators from Hewlett Packard and Texas Instruments to "desk top" computers, such as those from Wang and IBM (5100), are replacing single user applications in business, scientific and engineering and government. This is the "microprocessor threat."

- However, RCS will prosper because:

  - Software to perform certain applications processing and problem solution will not be available otherwise.

  - The computer/communications networks run by RCS vendors are only the delivery vehicle for the skills of their staff and their software products.

  - Innovation will come from RCS vendors; they will continue to create new EDP dollars.

  - In an increasingly complex society, RCS vendors will have the tools and skills to solve problems and respond to new demands more rapidly than most in-house EDP departments.

  - Even large in-house, remote computing users will continue to use outside RCS for applications development, unique data base services, and other specialized services.

- In summary, the demand for on-line computer access is expanding faster than in-house EDP departments can supply.

- Particular opportunities will also arise from acting as an information broker:

  - Bolt, Beranek & Newman's Nemex clearing-house which puts would-be buyers and suppliers of products together.

  - CDC's Technotec and Worldtec which provide technical information interchange services and seem to be primarily supported by consultants.

  - Lockheed's Dialog System which provides access to over 50 information banks.

  - Dow Jones' News Recall service.

- One of the particular trends in RCS is the increasing use of PTUs (programmable terminal units):

  - Offer reduction in communications cost and processing cost through increased throughput and error control on data entry.

  - Increase flexibility of entry process.

  - Allow local reports to be produced without expensive communications.

  - PTUs may be small business computers, minicomputers, or intelligent terminals.

- By 1982, 80% of processing services will involve communications.

- Voice response is being used now by companies such as GE and Rapidata for multipoint access to data without use of terminals and also for "prompting":

  - Use of voice response will continue for certain applications.

  - However, cheap, portable terminals with hard copy capability will be used instead for certain applications.

- In the 1980s, voice input will also be used probably in combination with other input/output modes.

- Cheap terminals are driving down the threshold cost for applications:

  - Applies to single location small establishments on one hand.

  - Also will open doors for multi-location applications in large companies.

- Pricing of RCS is a major problem for users:

  - Although hardware and communications costs represent less than 30% of vendor costs, "connect time," processing unit, and storage charges are still the main charging method, regardless of application.

  - Storage charges are perceived by users as "extortionate" compared to costs available on in-house equipment.

  - Variable costs to the user make budgeting and control difficult.

  - Bills are complex and voluminous, almost requiring a program for analysis.

- Impact on RCS could also come from the FCC "Computer Inquiry" into computer and communications services:

  - A proposal definition of a (non-regulated) data processing function is:

    "The use of a computer for the purpose of processing information wherein: (a) The semantic content, or meaning, of input data is in any way transformed, or (b) where the output data constitutes a programmed response to input data."

  - On the other hand, the characteristic of the communications function is that "the semantic content of information is not changed at the completion of a given process."

  - Problems with the definition proposals include that no consideration of time, or differentiation between data entering a network from a computer or terminal, is made .

  - Any prompted response qualifies as a data processing service.

- As a result of this inquiry, it is possible that the telephone companies will have more direct impact than IBM on the RCS market in the next five years.

## H. FACILITIES MANAGEMENT

- Facilities management implies that the user is making a long-term commitment for processing from the vendor and that the vendor has some on-site personnel involvement.

- Most processing may be done remotely. In fact, INPUT projects that most of the FM business will be remote by 1982 except for large installations, mainly in government and health insurance:
  - 50% of the total will be RFM in 1982.
  - Other FM contracts will include remote processing.
- Particular industry sectors using FM are, and will continue to be, government, commerical banks, and health insurance organizations.
- FM will be a solution for middle-sized companies:
  - Too large to avoid problems of increasing complexity, staff specialization, applications demand, and increasing user EDP awareness.
  - Too small to afford the solutions to these problems, and to attract and retain the necessary specialists.
- A "new" business which will expand rapidly is the local, general business, facilities management of small computer installations in small establishments:
  - Protects against software chaos.
  - Protects against staff problems.
  - Handles vendors for unsophisticated managers.
  - May integrate office automation and communications as well.

## I. BATCH SERVICES

- Non-time dependent services will continue to be handled in batch mode. As one key industry manager observed recently, "the band width of a truck is pretty high."

- Also, many applications will continue to have a large batch component; for example, delivery of payroll checks in payroll even when RCS is used for data entry and inquiry.

- Normal business expansion and price increases will account for batch services revenues not decreasing rapidly.

- The amount of work performed in pure batch mode will decrease in absolute terms over the next five years.

- Micromedia services will expand over the next 5 years as micromedia are used as interim storage systems between paper and electronic/magnetic storage.

- Micromedia services, particularly COM services, are provided by a variety of vendors, including subsidiaries of several banks:

  - Anacomp

  - Dataflow Systems

  - Data Reduction, Inc.

  - Grumman Data Systems

  - MANOSI (Maryland National Bank)

  - MCAUTO

- NCR

- PRC/Information Sciences Company provides sophisticated large-scale systems and services.

- The Computer Company

- United Airlines

- U.S. Data Corp. is the largest vendor with 40 services centers in the U.S., serving retail, credit agencies, banks, and insurance companies.

## J. SOFTWARE PRODUCTS

### 1. GENERAL MARKET CHARACTERISTICS

- One solution to the software "crunch," implied by the greater demand for applications software over the next five years than in-house users and computer manufacturers can supply, is the use of software packages.

- As a result of this, and of the demand by in-house computer users to be more effective and efficient in the use of their resources (hardware, communications, and people), software products is rapidly expanding as shown in Exhibit IV-11.

- Depending on the actions of IBM and other computer manufacturers, this market could grow much faster:

    - IBM seems to have doubled its revenues from software products, at least in some areas, within two years.

EXHIBIT IV-11

## SOFTWARE PRODUCTS MARKET FORECAST
## BY INDUSTRY SECTOR, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $120 | $150 | 25% | $ 230 | $ 430 | 24% |
| PROCESS MANUFACTURING | 62 | 70 | 13 | 110 | 190 | 20 |
| TRANSPORTATION | 25 | 30 | 18 | 35 | 60 | 15 |
| UTILITIES | 22 | 26 | 20 | 40 | 60 | 18 |
| BANKING AND FINANCE | 135 | 160 | 19 | 215 | 310 | 16 |
| INSURANCE | 52 | 62 | 19 | 95 | 150 | 19 |
| MEDICAL | 20 | 25 | 25 | 45 | 85 | 27 |
| EDUCATION | 18 | 22 | 20 | 30 | 60 | 22 |
| RETAIL | 25 | 30 | 20 | 50 | 120 | 30 |
| WHOLESALE | 39 | 48 | 25 | 75 | 150 | 25 |
| FEDERAL GOVERNMENT | 40 | 45 | 15 | 60 | 100 | 17 |
| STATE & LOCAL GOVERNMENT | 27 | 32 | 19 | 45 | 78 | 19 |
| SERVICES | 19 | 22 | 18 | 33 | 51 | 18 |
| OTHER | 21 | 26 | 25 | 40 | 72 | 23 |
| TOTAL | $625 | $748 | 20% | $1,103 | $1,916 | 21% |

($ MILLIONS)

  - IBM is selling more products and charging more for others.

  - IMS expenditures per installation may now average over $5,000 per month compared with $2,000 per month one to two years ago.

  - DEC and other mini manufacturers have moved strongly and aggressively to protect their operating systems and other software from being operated on microcomputers.

  - Manufacturers' pricing reflects the fact that main processor price/performance is improving rapidly while software costs are rising on a power curve.

  - In this regard, Series/I mainframe is cheaper than the software to run it.

- Growth rates of companies in the business are high; selected companies and this year's growth rates:

  - Software International, 60%.

  - UCC, 50%.

  - MSA, 40%.

  - Pansophic, 40%.

- However, these are among the more aggressive and successful companies; the vast majority of software comes from other sources. Also, the cream is being skimmed now.

- Turnkey systems using minicomputers are a tempting market but few have found the key to success:

  - Small, general business, "one-off" turnkey systems sales are generally not profitable.

  - Multi-unit sales can be profitable.

  - Specialized sales can be profitable.

  - Vendors generally underestimate the costs of installation, support and maintenance.

- In system packages, sales will reach over $750 million by 1982 and could be far higher with continued IBM "unbundling":

  - Tools for productivity are a prime opportunity.

  - Interfaces between and among computers, software systems, and terminals are also needed.

  - DBMS will grow at 40% to 50% per year.

  - System products are exposed to IBM and other mainframe vendor use of microcode and other "defensive" and "offensive" movements.

- Applications packages will grow even faster in acceptance to almost $1 billion by 1982:

  - Small computers create a market (100,000 X $3,000 per year is $300 million market in 1982).

  - Secondary applications in large EDP shops are most successful; they take the strain off without interfering in overall software development too much.

  - Applications packages written properly can take advantage of manufacturers' developments more easily than system packages.

  - Sale of applications packages reduces the potential for processing services sales.

  - INPUT expects to see major application products announcements from IBM with the next hardware series.

- In the software products industry:

  - Products are generally underpriced compared to user value received.

  - Vendors are becoming credible to users in terms of size, stability, support, and performance.

  - There are many one product companies which lack marketing and sales capabilities.

## 2. IBM DBMS EVOLUTION

- IBM, in its July 1971 Statement of Direction, identified its Data Base/Data Communication (DB/DC) strategy as based on three DB/DC products:

  - Customer Information Control System (CICS).

  - Information Management System (IMS).

  - Generalized Information System (GIS).

  Since this time, a pattern of development has clearly emerged, which signals future developments in IBM DBMS.

### a. DB/DC Development (1971-1975)

- The two elements which have emerged in this period are the key roles Data Language/I (DL/I) is playing in IBM's Data Base strategy, and System Network Architecture (SNA) is playing in the Data Communication strategy.

- In 1972, IBM announced DL/I interfaces for GIS and CICS, and extended DL/I support to the DOS/VS user with announcements of DL/I DOS/VS.

- 1973 saw the announcement of CICS/VS, IMS/VS and GIS/VS. These products were key elements of IBM's Virtual Storage strategy for user application growth, and together with announcement of DL/I ENTRY, confirmed the 1971 Statement of Direction. 1973 also saw the emergence of System Network Architecture (SNA), and announcement of support by CICS/VS and IMS/VS of future SNA terminals.

- In 1974, IBM announced GIS DOS/VS, based solely on the use of DL/I DOS/VS and DL/I ENTRY, with no support for access methods such as DAM or ISAM.

- 1974 also saw Display Management System (under control of CICS/VS) reannounced as DMS II for DOS/VS and with significant enhancements over DMS (originally announced in 1971 for CICS/OS only).

- The other significant announcements in 1974 were mainly hardware: the announcement of the 3790 Communication System (initially announced for the insurance industry), and announcement of the 3850 Mass Storage System with the ability to support 476 billion bytes on-line.

- 1975 resulted in enhancements to CICS/VS and IMS/VS, and an emphasis through IBM marketing programs of ease of application development by use of DMS II DOS/VS and GIS DOS/VS. However, this was hindered to some extent by lack of DL/I support in DMS II.

- 1975 also saw announcement of the 3344 and 3350 DASD, and announcement of the Extended Telecommunication Module (EXTM) of CIS/DOS/VS-providing an entry level-like capability for DOS/VS users, and supporting both SNA and pre-SNA terminals.

- To reaffirm its strategy, IBM in 1975 reannounced its 1971 Statement of Direction, and identified CICS, IMS/VS (and DL/I for DOS/VS) and GIS/VS as its prime DB/DC products for the next 5 years.

### b. DOS/VS DB/DC Problem Areas

- IBM's DB/DC products, while providing comprehensive function, in general exceeding that of its competitors, have suffered from the natural by-products of that function, in:

  - Complexity.

  - Performance.

  - Code quality.

- To address the first two of these problems, IBM made some key announcements in 1975 which were at that time intended only for the DOS/VS environment. These were:

  - CICS/DOS/VS Starter System.

  - CICS/DOS/VS Subset Option.

- These two announcements were directed mainly at the first-time user and provided a pre-generated version of CICS/DOS/VS, which offered a subset of the full CICS/DOS/VS facilities. This subset was easy to install, with a reduced path length.

- The starter system paralleled similar development in IBM Canada of an Installation Productivity Option (IPO) for CICS/DOS/VS, which provided a pre-generated, pre-maintained version of the subset option, as well as a full-function CICS/DOS/VS system. These IPO's were originally developed as part of demonstration marketing programs based on the use of DMS II DOS/VS and GIS DOS/VS to show application development productivity with these two products. The success of this marketing program in IBM World Trade countries saw the development of other IPOs for:

  - DMS II DOS/VS.

  - GIS DOS/VS.

  - DL/I ENTRY.

  - DL/I DOS/VS.

- The ease of installation and reduction in complexity and overhead of these IPOs resulted in rapid market acceptance, and an extension of the Installation Productivity Option concept into the OS/VS environment. This is discussed further in "IMS/VS Problem Areas" below.

- It appears that IBM has gained control of the complexity and performance/problems of the past through subset and IPO approaches. We can expect to see further improvements in the future, such that these problem areas may tend to be less severe.

- An indirect by-product of the above IPOs may prove to be an improvement in code quality, through availability of standard fully generated, tested and maintained systems. However, with the pressure from users for additional enhancements, it is likely that code quality will continue to remain a significant problem area for DOS/VS DB/DC.

c. IMS/VS Problem Areas

- Problem areas which are impacting wider use of IMS/VS in industries, such as the steel industry, include the need for:

    - 24-hour operation, with an inflight data base maintenance capability.

    - Faster recovery and restart time, for higher system availability.

- These problem areas can only be effectively addressed by enhancements to IMS/VS (see below in "Future Enhancements - Current Products").

- However, the most significant problem areas with IMS/VS at present also include those discussed for DOS/VS above, namely:

    - Complexity.

    - Performance.

    - Code Quality.

- 1976 saw the emergence of an "IMS/VS Primer," initially directed to the first-time IMS/VS DB user, and later also to the first-time DC user. This was an attempt by IBM to document a subset of the IMS/VS facilities sufficient to satisfy the needs of the inexperienced user. Such action by IBM will remove some of the complexity of IMS/VS.

- However, the most significant development towards this goal would be an IMS/VS Subset Option (along similar lines as the CICS/DOS/VS Subset Option), and distributed as a standard component of IMS/VS. In conjunction with a pre-generated IMS/VS Starter System, the inexperienced IMS/VS user would then be able to be productive much sooner.

- The announcement (in conjunction with the System/370 Model 138 and 148 announcement in 1976) of Installation Productivity Options (IPO) in the OS/VS environment appear to be aimed in this direction. At this time, IBM announced IPOs for:

  - OS/VS1.
  - VM/370.
  - IMS/VS DB and DC.
  - CICS/OS/VS.
  - GIS/VS .

- These should provide an easier installation and maintenance environment, and, together with the "IMS/VS Primer" documentation for easier data base design and implementation guidance, may help remove some of the IMS/VS complexity.

- The problem of performance, which has plagued IMS/VS since its birth, is being addressed by IBM in a number of areas. For example, the support of IMS/VS in a multiprocessing environment enables an MP 158 or MP 168 to offer improved performance over a uniprocessor environment.

- However, the most promising performance development has been the IMS/VS Fast Path announcement in 1976 (see "Current DB/DC Environment" below). This enables IMS/VS to interpret specific transactions, processing them through VTAM and MVS Fast Paths and using Main Storage Data Bases (MSDB) and a Data Entry Access Method (DEAM) to reduce I/O activity and IMS/VS overheads. The performance improvement resulting from Fast Path is understood to be dramatic.

- While the initial Fast Path announcement restricted such transactions only to MSDB and DEAM, it is anticipated access to standard DL/I data bases may be possible in the future (see "Future IBM DBMS Direction" below).

- In 1976, IBM had severe problems with IMS/VS code quality. This has been a continuing problem, and is a direct result of the high level of function provided by IMS/VS. No significant improvement can be seen in this area, with additional enhancements being added to meet user demands. Code quality is likely to be the single greatest problem area of IMS/VS in the future.

### d. CICS/OS/VS Problem Areas

- In 1976 IBM also announced a High Performance Option for CICS/OS/VS under MVS, using VTAM and MVS Fast Paths and apparently offering a performance impact comparable to that of IMS/VS Fast Path.

- The announcement of the CICS/OS/VS IPO may also help reduce some of the complexity of this product.

- Code quality, however, may not exhibit the same improvement in the future, and may become the major problem with CICS/OS/VS also.

### e. Current DB/DC Environment (1976-1977)

- The future direction of IBM DB/DC developemnts emerged more strongly in 1976 than in any earlier year. That year saw memory increases on the System/370 Models 115 and 125 (to 384K and 512K respectively) and the announcement of the System/370 Models 138 and 148 (with storage up to 1 MB and 2 MB respectively).

- The significant aspect of the 138 and 148 was the integration (through hardware assist features) of VM/370, and the emergence of VM/370 as a key application development aid (through use of the Conversational Monitor System - CMS).

- 1976 also saw a definite emphasis emerging of DOS/VS and MVS enhancements and an effort to move OS/VS1 and SVS users to MVS.

- In the DB/DC area, some significant announcements occurred. These are identified briefly below, and discussed in more detail later in this report.

- CICS/VS announcements included:

  - High Level Language CALL interface.

  - Dynamic task backout (giving recovery/restart support closely approaching that of IMS/VS).

  - CICS/OS/VS High Performance Option (under MVS only).

  - Support of 3790 enhancements for enquiry and update, and 3270 data stream compatibility.

  - Support of 3767 and 3370 communication terminals via VTAM.

- IMS/VS announcements included:

  - Support of 3790 enhancements for enquiry and update, and 3270 data stream compatibility.

  - Support of 3770 and 3767 terminals via VTAM.

  - Multiple Systems Coupling (MSC) feature for communication between IMS/VS system in local and remote CPUs via channel to channel communication for local CPUs, and BSC link for remote CPUs.

  - IMS/VS Fast Path (FP) feature, supporting a Data Entry Access Method and Main Storage Data Bases for high-volume, high-performance IMS/VS applications.

- DL/I interfaces were announced for more program products, such as:

  - DMS/VS, an enhancement of both the DOS/VS and OS/VS versions of DMS II to provide access to DL/I data bases.

  - STAIRS/VS, to provide access to IMS/VS DL/I data bases as well as STAIRS text data bases.

- Data Dictionary announcement, providing full program product support commitment for IMS/VS, and a Data Dictionary for DOS/VS DL/I users.

- Installation Productivity Option (IPO) announcements, providing pre-maintained systems for:

| DOS/VS | OS/VS & VM/370 |
|---|---|
| - DOS/VS | - OS/VSI |
| - CICS/DOS/VS | - IMS/VS DB and DC |
| - DL/I ENTRY | - CICS/OS/VS |
| - DL/I DOS/VS | - GIS/VS |
| - GIS DOS/VS | - VM/370 |
| - DMS II DOS/VS | |

## 3. FUTURE IBM DBMS DIRECTION

- The DB/DC announcements and deliveries made by IBM through to 1976, as discussed above, allow us to make an assessment of future DBMS direction. This will be discussed in terms of:

  - Future Enhancements - Current Products.

  - Future Security.

- Distributed Data Bases.
- Distributed Processing.
- Future DBMS Products.

a. Future Enhancements - Current Products

- It appears that the support IBM is providing through its DOS/VS DB/DC products - namely CICS/VS, DL/I DOS/VS and GIS DOS/VS - is approaching that offered by IMS/VS.

- Discussions with DB/DC users indicate that, in the short term, market pressures will require IBM to announce the following support for products.

- DL/I:

  - Shared DL/I data base access from batch and CICS/DOS/VS partitions.
  - Program isolation, to enable DL/I to enqueue for update at the segment occurrence level, rather than segment type, for improved performance.
  - Batch checkpoint/restart for DL/I DOS/VS.
  - Distributed freespace and disk logging for DL/I DOS/VS.
  - DL/I DOS/VS Subset Option and Starter System.
  - Complete DB/DC System Installation Productivity Option, providing a consolidated pre-generated, pre-maintained DB/DC system comprising DOS/VS, CICS/VS, DMS/VS, DL/I (ENTRY or DOS/VS) and GIS DOS/VS.

- GIS DOS/VS:
  - GIS DOS/VS Update capability, and ability to load DL/I data base from GIS.
  - On-line GIS DOS/VS Syntax Check capability.
- CICS/VS:
  - Outboard BMS formatting for SNA terminals, such as 3790 or 3600, and enhancement of 3650 outboard BMS formatting.
  - Ability for SNA logical units (work stations) to communicate with other logical units.
  - High level interfaces for Assembler, similar to that announced for COBOL and PL/I.
- IMS/VS:
  - 24 hour operation, with ability to handle inflight DL/I data base maintenance.
  - Fast restart capability, for higher availability in time-critical environments (e.g., steel industry).
  - Ability to specify data prestaging for IMS/VS-3850 applications, offering improved performance with large 3850 mass storage data bases.
  - Support of outboard MFS formatting for SNA terminals, such as 3790 or 3600.
  - Queue management performance improvements.

- IMS/VS MSC:

    - Support by IMS/VS Multiple Systems Coupling feature of remote CPU link by VTAM, in addition to current BTAM link (see below, in "Distributed Data Bases").

    - Hardware data sharing capability (perhaps in DASD control unit) to permit local MSC CPUs to concurrently access common DL/I data base, enqueuing at the Segment Occurrence level for increased performance.

- IMS/VS FP:

    - Extension of IMS/VS Fast Path to permit access to standard DL/I data bases, as well as Fast Path Data Entry Access Method and Main Storage Data Bases, in processing transactions.

- The pressure being exerted by DB/DC users for the above enhancements is such that IBM may be forced into announcing most, if not all, of the above enhancements by mid-1978.

### b. Future Security

- The increasing public concern for privacy of information will be reflected in security enhancements to IBM's DB/DC products.

- In the short term, an improvement in the security capability of CICS/VS (DOS/VS and OS/VS) can be expected to more effectively inhibit access to information by unauthorized people. Increasing use of DL/I data bases, via the CICS-DL/I interface, will enable DL/I security capabilities to extend to CICS/VS applications. For example, DL/I limits an application program to only that subset of the data base it is authorized to access, and furthermore controls the level of access as read-only, update, add, delete or exclusive use.

- However, CICS/VS can control access to application programs from terminals only by means of an operator sign-on capability. Security can be violated by an unauthorized person signing on as an authorized user, from any CICS/VS terminal in the network. The ability to restrict access not only to authorized users, but also to authorized physical terminals, is an enhancement IBM could readily add to CICS/VS in the short term.

- A greater level of access control is needed in DL/I to control access at the field level rather than at the segment level (several related fields) as at present.

- This degree of security is currently provided by GIS DOS/VS and GIS/VS, whereby specific fields in a DL/I data base are related to specific security codes. A user, on nominating a security code, is only allowed access to those fields related to that code.

- The amount of development, and the additional performance overhead which this implies, indicates that such enhancements may be more long term, and in fact are unlikely to be implemented in IBM's current data base products (DL/I DOS/VS and IMS/VS). Instead, a greatly enhanced level of security control is more likely to be found in IBM's next generation of DB/DC products.

- The DB/DC Data Dictionary program product, announced in 1976 for both DL/I DOS/VS and IMS/VS, offers a means for control of data. It provides information about where all data elements are used in an installation (in data bases, programs, application systems, etc.), and enables the effect of a change in one element of a DB/DC environment to be followed through all programs, systems, data bases, applications, etc., affected by that change. As such, it provides the EDP Installation with a method of controlling "raw materials" - that is,data - similarly to the way a manufacturing application controls its raw materials, components and assemblies.

- However, the implications of a Data Dictionary go much further than its current use as described above. When expanded into a "System Dictionary," such a facility can provide not only information about data used by DB/DC applications, but also data used by compilers, operating systems, job control, etc.

- At this level, a System Dictionary can become an all-powerful guard-the-"Keeper of the Key," through which all requests for information must pass.

- Such a System Dictionary becomes the ideal place to implement the most stringent security controls which apply across the whole EDP installation.

- The strong emphasis IBM is placing on the current DB/DC Data Dictionary products reflects the realization. It is impractical for IBM to consider implementation of a System Dictionary in the current DB/DC and System/370 environment. The number of "hits" on almost every DB/DC product, compiler and operating system, not to mention the much greater investment in users' application programs, dictate that a System Dictionary will be an evolution, which may not even start until IBM announces its replacement products for the System/370 and current DB/DC products.

- The importance of a System Dictionary to security, as described above, makes it a central component to IBM's future DBMS strategy.

### c. Distributed Data Bases

- The future development of Distributed Data Bases was first signalled in 1976 with the announcement of the IMS/VS Multiple Systems Coupling (MSC) feature. This permits many IMS/VS CPUs to be inter-connected, either locally via channel-to-channel (CTC) link, remotely via BSC line, or (for backup purposes) via memory-to-memory (MTM) with two or more IMS/VS systems in the one CPU.

- Terminals can enter transactions for processing fully on their host CPU (as for standard IMS/VS) or for part-processing on their host CPU and routing to another CPU in the MSC network. On receipt of the routed transaction, that CPU can process it further -- permitting access to its own DL/I data bases -- and then transmit the response back to the originating terminal via its host CPU, or to any other terminal attached to a CPU in the MSC network.

- Alternatively, the originating host CPU may not process the transaction at all, but instead route it immediately to another CPU in the MSC network fur full processing, or partial processing and further CPU routing.

- This distributed data base approach permits implementation of applications requiring geographically dispersed data bases, such as banking data bases in different cities. Transactions entered from any terminal can access data bases on any CPU in the MSC network, transparently to the terminal operator.

- The surprising element of the 1976 MSC announcement was the support of the remote CPU link via BTAM, rather than VTAM - contrary to IBM's stated SNA strategy. It appears that BTAM support was intended as an intermin measure, until additional capabilities of VTAM had been announced and were available.

- With the BTAM link, transaction must pass from one CPU, through to IMS/VS, and then be routed to the next CPU and its IMS/VS. Thus, each CPU "leg" adds significantly to the total instruction path length for that transaction, and hence its response time performance.

- As VTAM and NCP/VS are enhanced, it is expected that the IMS/VS MSC will support remote links via VTAM. This will permit transactions which do not require any processing by a CPU (but which must pass through that CPU to reach another CPU in the network) to be processed more efficiently. In this case, the transaction could be routed by the 370X, using NCP/VS directly to the next 370X in the network, without incurring any IMS/VS overhead in the bypassed CPU.

- The performance advantages are obvious, with only those CPUs which must participate in total processing of the transaction contributing to its instruction path length, and hence response time.

- Announcement of such support of VTAM remote links is reasonable to expect in the short term, perhaps one year, as the necessary VTAM support appears to be provided by the recent VTAM announcement (of SNA 3), or perhaps by the next VTAM release (SNA 4 ?).

- The support offered by MSC for IMS/VS can be expected to be extended also to CICS/VS, so permitting CICS/VS-DL/I systems to route transactions for processing by different CPUs. This may not happen for perhaps 2-3 years, but at that time it should also be possible for transactions to be routed from IMS/VS CPUs to CICS/VS-DL/I CPUs. Such CPU networks could then comprise one or more large IMS/VS CPUs, as a central processing "core," with smaller DOS/VS CPUs communicating with the central CPU core. Subsets of DL/I data bases could then be geographically distributed on different size mainframes.

- IBM does not appear to be providing subsets of DL/I in intelligent controllers such as the 3600 Finance Communication System or 3790 Communication System. Disk storage capability of these controllers is limited (maximum of 27.5K bytes on 3790), and IBM appears content to use macro languages, rather than COBOL, BASIC or PL/I to program these controllers. Consequently, this lack of program language compatibility with mainframe CPUs seems to make the need for a subset of DL/I on intelligent controllers less important.

- The exception to this might possibly be the System/3 or System/32. At one stage, around 1973-1974, IBM seemed to be moving towards a DL/I subset on the System/3, but apparently felt the System/3 market did not need a DBMS capability at the time. This may change in the future, with greater emphasis on Distributed Processing, but at the present IBM seems content merely to permit its GSD products only to communicate with its DPD products, and not allow application programs to compatibly migrate between the two Divisions' products.

### d. Distributed Processing

- IBM's Distributed Processing strategy appears to be firmly in place now, with new Communication products based on SNA, and with full emphasis on intelligent controllers such as the 3790.

- Additional industry-specific communication systems can be expected, adding to the current 3600 Finance Communication System, 3650 Retail Store System and 3660 Supermarket System.

- The 3790 Communication System seems to be destined for more general-purpose development, as indicated by the 1976 enhancements providing support for inquiry/update applications into DB/DC products, and 3270 data stream compatibility. The inquiry/update enhancement removed the original inquiry-only constraint to effective 3790 application use. The 3270 data stream compatibility permits existing local or remote 3270 applications (perhaps based on DB/DC) to migrate transparently to a leased-line, or locally-attached, 3790.

- The attachment of new terminal devices to the 3790 can be expected in the future, perhaps with larger visual display units in addition to the 3277 Display Stations. Other devices, such as faster printers, graphic displays and diskette readers may join the 3790 terminal family.

- The disk storage capability can be expected to expand from the current 27.5K and with it further offloading of CPU processing. For example, the CICS/VS BMS outboard formatting support currently available in the 3650 could be expected to be enhanced, and also supported on the 3790 (and maybe 3600) for CICS/VS and IMS/VS.

- As discussed above in "Distributed Data Bases," while it does not appear that IBM will provide a subset of DL/I on the 3790, say, there seems however, to be a trend towards more productive 3790 application program development. This trend is towards a Display Management System (DMS) type approach for rapid development of programs using a fill-in-the-blanks technique.

- The announcement of Series/1 with its limited support and purchase-only availability appears to be a bold move by IBM to gain an advantage on the many Small Business Systems available, which are potential distributed processors -- particularly if they provide an SNA interface through SDLC as some appear to be developing.

- IBM's distributed processing strategy appears now to be well under control. Whatever may happen in the near future with new mainframes or DBMS products, it seems certain that SNA will shield the distributed processing market from changes in those areas.

### e. Future DBMS Products

- As mentioned earlier, the key elements which have emerged from IBM's DB/DC strategy are the importance of SNA and of DL/I.

- IBM seems to be pinning all of its hopes on DL/I as the only product available at present, which is able to shield application programs from physical device dependencies. The increasing availability of DL/I interfaces, not only to its prime DB/DC products but also to application products such as DMS/VS and STAIRS/VS, points to the fact that IBM will use DL/I to migrate to its successor to the System/370, and to future DBMS products. The strong marketing emphasis IBM is placing on DL/I reinforces this view -- it appears to be as important as operating systems were in the 1960s.

- And yet, there is much speculation about the possibility of relational data bases being the way of the future, and a DL/I interface to a relational data base is not easy.

- Development work on relational data base is continuing in IBM, with Dr. Codd, IBM Research Fellow at San Jose, and with other activity, at least in the UK. The article in IBM Systems Journal Vol 15 No 4 (1976) pp 285-308 on "The Peterlee Relational Test Vehicle-A System Overview" by S.J. Todd, describes the current status of development of an interactive relational data base prototype at IBM UK Scientific Centre at Peterlee, County Durham. The Peterlee Relational Test Vehicle is not a full-fledged data base system (for example, it has no backup and recovery support). Considerable work still has to be done in the area of performance, apparently, but the article describes an evolving "Information System Base Language" for creation and access of data relationships.

- Whether the likely DBMS of the future is indeed a Relational Data Base system, or instead a higher-level implementation based on a DL/I-like approach, is difficult to determine at this stage. Setting aside the architectural considerations, a number of characteristics of this future DBMS can however be determined today. These characteristics are outlined below:

- Massive Data Base Capability: The announcement of the 3850, together with increases in storage capacity on all current System/370 models, and technological developments such as bubble memory, point to the future IBM systems as being mass memory systems. Trends of development seem to indicate that the current 24 bit addressing capability of 16MB on 370 is an increasing constraint. The development of MVS, to support multiple regions each up to 16 MB, reinforces this view. It appears that future IBM systems will have to adopt an architecture based on perhaps 31 or 32 bit addressing, or even higher. For example, a 31 bit addressing architecture would permit direct addressing of 2,147,483,648 bytes (2048MB):

    - This mass memory addressing capability and the continuing trend to lower memory prices suggest that future data bases (at least of today's sizes) may reside completely in memory. This announcement of the 3850 is interesting in this regard, as it made economically feasible the on-line storage of data which previously could only be retained economically on tape, or may not have been economical to put on computer at all. The problem with such massive data bases is that physical data preparation and loading may in fact take years.

- The announcement of the 3850 for a DB/DC environment suggests that IBM has used the 3850 as a breakthrough into the massive data base environment, so that the requirement for mass memory systems and data bases will be there when the technology is economically viable. At that time, the current 3850 response time and design constraints for effective DB/DC use can be expected to disappear.

- Single Data Base Product: The move to DL/I as the common data base language today, and the merging of function between CICS/VS and IMS/VS for example, suggest that these two products will merge into a single DBMS. The days have passed when IBM could dictate developments to its users, and discontinue products without a migration path to new products. The emphasis IBM has placed on current DB/DC products indicates that such a future "all-encompassing" DBMS must have a transparent interface for migration of current CICS/VS and IMS/VS DB/DC applications.

- Ease of Use: It is likely that such a future DBMS will also have a higher-level interface than CICS/VS and IMS/VS, oriented mainly towards an end-user query language using natural languages such as English. Access to such data bases will be possible for the general public, with very little training, and no prior computer experience. The DBMS is likely to be an integral part of the computer (see below), or at least of the operating system, and may provide full-function without the need for complex systems generation. Aids should be provided to automate data base design, loading and performance evaluation (such as the current Data Base Design Aid, and DBPROTOTYPE with IMS/VS).

- Ease of Application Development: Similarily, the increasing trend towards on-line applications generators, such as DMS/VS, suggest that on-line application development will be conducted at a higher level than at present, progressing from application design directly to application specification and debugging, so bypassing in most cases an intermediate programming step. The result will be significantly increased application development productivity, but particularly increased maintenance productivity. The DBMS, in this environment, will become submerged into the operating system, or the hardware itself.

- DBMS Implementation in Hardware: The rapid development of microprocessors, and development in microcoding techniques, together with an increased DBMS function and the need for higher performance, suggest that much of the future DBMS will be implemented in hardware. The remainder of the DBMS will almost certainly be implemented in the operating system, with more complete integration of data communications into the DBMS:

    - It is believed that developments have been underway for some time at IBM to implement parts of IMS in microcode. The availability of the VM Assist Feature on the Models 138 and 148 reflect the trend to increased hardware implementation of code. Whether such IMS/VS microcode will be announced, or whether it will be used merely for research into future DBMS hardware implementation, is not know.

- System Dictionary: As discussed earlier in this report, a future DBMS is likely to be based fully on a System Dictionary, which would be the sole controller and locator of all data. Rather than taking a passive descriptive role as do the current Data Dictionary products, such a System Dictionary is likely to take a much more active role in the availability of data. Not only would it contain information describing the content and use of data, it would also be able to locate the relevant data, retrieve, update, protect and generally control the data. In this way, such a System Dictionary may be the Data Language of the DBMS.

- Security: The central control of all data by a Systems Dictionary enables much more stringent security controls to be applied than are at present possible. This has been discussed earlier in "Future Security."

- Time-Sharing Interfaces: It is expected that a future DBMS will be used for access to all data from all applications. This includes access from interactive time-sharing (personal computing) languages such as APL and BASIC, and standard languages such as COBOL, PL/I, FORTRAN and Assembler (which will still continue to be used as well the query languages discussed in "Ease of Use" above). Such access to data base will permit not only the interactive development and testing of data base applications in a time-sharing environment, but will also permit direct access to data bases for problem solution.

### f. User Impacts: Evolution or Revolution

- The realistics of the environment are that IBM has a massive user base to move to what may possibly be radically new hardware and DBMS technology. The problem may be less a problem of technological development, and more a problem of migration. IBM apparently realized this, and determined that concentration of development and support of CICS, IMS and GIS would make this migration more manageable; hence, the 1971 Statement of Direction.

- However, market pressures have forced some diversions from the strategy to meet user requirements, and user migration to the strategic DB/DC products - while increasing all the time - may not yet be sufficiently fast enough for IBM. Certainly, it appears obvious that IBM deferred release of its "Future System" from what seemed to be a 1976 planned date to some time in the future. Whether such deferment was due to technological constraints, or slower-than-expected user migration to a common DB/DC base, or insufficient competitive pressure to warrant a new system release, is not known.

- But it appears certain that such announcement may occur perhaps in the 1979-1981 time-frame. 3000 Series and System/370 announcements, such as the Models 138 and 148, are "mid-life kickers" to the /370 range.

- It seems certain that any future DBMS announcement will be closely related to the follow-on system after the /370. The architecture of this system will determine the extent to which such future DBMS represents a "revolution" (perhaps with emulation for current products) or instead an evolution from the current DB/DC environment.

## K. PROFESSIONAL SERVICES

- Consulting of all types will be in demand by users as will system developmental help.

- Consequently, professional services will maintain a healthy growth rate, as shown in Exhibit IV-12.

- Continued pressure for use of outside services, coupled with demand for systems will cause the federal government to account for over 25% of the market.

- Retail industry, because of pressures to be competitive, will have to improve its systems use and outside resources will have to be used, since they are generally lacking internally:

    - Accountants will do particularly well in this market.

    - Computer/communications applications, particularly for distributed processing, will provide opportunities.

- Expertise and availability will continue to be key reasons for the use of professional services, but increasingly knowledge of, and techniques for, efficient development will be sales factors.

- Software maintenance contracting will increase.

EXHIBIT IV-12

## PROFESSIONAL SERVICES MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982

| INDUSTRY SECTOR | MARKET FORECAST BY INDUSTRY SECTOR, 1976-1982 | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1982/76 % |
| DISCRETE MANUFACTURING | $ 170 | $ 190 | 11% | $ 230 | $ 320 | 11% |
| PROCESS MANUFACTURING | 105 | 110 | 5 | 120 | 175 | 9 |
| TRANSPORTATION | 21 | 24 | 15 | 30 | 40 | 11 |
| UTILITIES | 55 | 59 | 9 | 70 | 90 | 9 |
| BANKING AND FINANCE | 85 | 100 | 18 | 140 | 230 | 18 |
| INSURANCE | 60 | 68 | 13 | 95 | 145 | 16 |
| MEDICAL | 35 | 40 | 14 | 50 | 75 | 14 |
| EDUCATION | 31 | 34 | 10 | 38 | 40 | 5 |
| RETAIL | 35 | 40 | 20 | 55 | 100 | 19 |
| WHOLESALE | 33 | 37 | 12 | 45 | 66 | 12 |
| FEDERAL GOVERNMENT | 255 | 330 | 29 | 440 | 620 | 16 |
| STATE & LOCAL GOVERNMENT | 113 | 127 | 12 | 160 | 222 | 12 |
| SERVICES | 8 | 9 | 15 | 12 | 19 | 16 |
| OTHER | 44 | 49 | 12 | 60 | 83 | 11 |
| TOTAL | $1,050 | $1,217 | 16% | $1,545 | $2,225 | 13% |

($ MILLIONS)

## L. VENDOR ACTIVITY

- Following notes represent a few of the activities of vendors in the computer services industry which cross user industry lines and reflect trends.

- APL Services offers an information resource to 350 off-shore drilling rigs providing response to inquiries against a data bank.

- Applied Data Processing offers Resource/100 turnkey system for manufacturers and wholesalers:

    - Over 50% revenues from software.

    - Basically an "on-going" package service with processor provided.

- Applied Data Research got into hardware/software with the STAR telephone control monitoring system:

    - Backlog year end 1976 was $1.5 million compared to 0.3 million year end 1975.

    - Basically stayed stable for 5 years while software revenues went from $3 million to $10 million.

- Artificial Intelligence Corporation offers ROBOT which can "talk" in English.

- Boeing Computer Services has introduced Executive Information System (EIS) to support financial planning RCS:

    - Arranged with Mathematical Application Group to use 3-D graphics software, Synthevision.

- Bowne Timesharing has expanded word processing business from $2 million to $7 million in 5 years.

- COMNET has greatly expanded its FM contract base:

    - $3 million contract with MCI Telecommunications.

    - $20 million contract with EPA.

    - $9 million, 3 year contract with Office of Education, "offloaded" from HEW data centers.

    - $4.5, 3 year contract with Bureau of Naval Personnel.

    - National timesharing contract with U.S. Postal Service.

    - Obtained fist award from GSA under TSP contract.

- Compmark Data Services from Standard and Poors provides data bank on companies.

- CompuServe offers Kent Data System econometric forecasting model and data bases.

- Computer Dimensions (Itel) sells network services based on "shared use."

- COMTAC offering image processing front-end for IBM Systems/360 and 370; processes x-rays, photos, etc.

- Dun and Bradstreet Companies plans to enter the processing services market by the acquisition of Medical Computer Systems Inc., and Fortex Data Corp.

- First Data Corp. (ADP) is offering simulation services through Dynamo, developed from the work of Jay Forrester, for use in industrial, social, economic, and engineering systems.

- Foresight Systems (UCS) is offering FORESIGHT (planning tool for modeling and financial reporting) and FORETAX (state tax compliance system).

- Informatics (Equitable) is the largest non-manufacturing software products company with 1976 software product revenues of $21.1 million:

    - Total revenues for 1976 were $60 million (projected for $70 million in 1977).

    - $4 million from parent, $56 million from commercial and government.

    - Processing revenues are $16 million.

    - PMI, acquired from GTE, revenues are $13 million.

    - MHDS ~~MDSI~~, acquired in 1977, had 1976 revenues of $8 million.

- Interface Technology provides an interactive portable data entry terminal for $75.00, purchase price. With 16-digit display it costs $600.

- ITT is in the computer/communications applications business, at least in the Federal Government. For example, it has a $36 million, Air Force, Satim IV, communications network development contract.

- Keane Associates is an example of a company moving from professional services to facilities management, packaged products, and packaged "technique"; for example, Keane provides systems development standards and productivity management packages.

- Lockheed's Dialog now has over 50 data bases:

    - Costs are $10 to $20 per search.

    - High speed display/printing available at 2400/4800 Gps.

  - Low speed, dial-up access also available.

  - 2000 corporate users.

- Management Science America increased revenues in software products from $7.9 million in 1975 to $12.3 million in 1976:

  - Spending more than $2 million per year on enhancements, R&D and maintenance.

  - 30% of business with banks.

- Mathematica with $21 million per year is a large software products and services company:

  - RAMIS II is new DBMS product replacing RAMIS I, one of the first DBMS.

  - Growing at 25% per year.

- National CSS revenue distribution is typical of the general RCS vendors:

  - 50% of RCS services are "utility."

  - 34% applications specialized.

  - 8% industry specialized.

  - Remainder from professional services, batch processing, education, etc.

- NCSS offers a spectrum of services including scientific and engineering and financial modeling applications:

  - NOMAD, its proprietary DBMS, is its most successful product ever.

  - Offers Economic Modeling System from Economic Sciences Corp.

  - Has 10,000 users overall.

- NCR is committed to processing services:

  - 83 worldwide centers.

  - Upgrading; put in $17 million of new equipment in 1976.

- National Data has $7.6 million per year from cash management services.

- Pay Fone Systems provides payrolls for as little as $50 per month using a simplified data entry terminal with batch response delivery.

- Proprietary Computer Services is one of the leading APL service companies; others are:

  - APL Services (The Computer Company)

  - Boeing Computer Services

  - Grumman Data Services

  - I. P. Sharp

  - National CSS

  - Scientific Time Sharing

- Rapidata is specializing in the financial industry:

  - PROBE used for analysis and forecasting of economic data at more than 650 users.

  - FISCAL is used for financial analysis by 250 users.

  - Also offers X2C, a proprietay data management system.

  - Zero base budgeting a cross industry, general business package.

  - New time series forecasting system using state space forecasting, a derivative of control theory.

  - Agreement to acquire 200 timesharing customers of ACTS (Lear Siegler).

  - Professional services contracts with TRW Business Systems to provide software support for Singer System 10s.

- Scientific Time Sharing has been using its AMDAHL computer; impact on profitability is unknown.

- Service Bureau Company (CDC) has 2,000 users for PROPHIT II, its planning analysis, modeling and reporting system.

- Systems Development Corporation still has 75% Federal Government and 50% DOD revenues despite major attempts to get into market:

  - Doubled number of users for Search Services in 1976.

  - Designed PEPE (Parallel Element Processing Ensemble) which does 258 MIOPS (million operations per second) for floating point arithmetic and 2,880 MIOPS for interger instructions.

  - Health claim adminstrative systems services for companies such as Security Pacific National Bank, Garrett Corporation, and Auto. Club of Southern California.

- TRW in its credit and financial management services (NACIS) has agreement with members of National Association of Credit Managers for individual credit information.

- UCC commercial software sales in 1976 were $6 million while SED (the RCS division) had sales of $15 million.

- Wang Data Centers is specializing in human resource management services.

# V. INDUSTRY ANALYSIS

# V INDUSTRY ANALYSIS

## A. INTRODUCTION

- This section presents data on users of computer services in each of 14 industry sectors.

- This year INPUT has made a considerable effort to provide demographic data in each of these sectors so that the computer services market forecasts can be related to these characteristics.

- Demographic data have been collected from a variety of sources, including, associations and publications. Basic information has been obtained from U.S. Government sources, including:

  - County Business Patterns (1974).

  - U.S. Statistical Abstract (1976).

  - Industrial Outlook (1977).

  - Census of Business (1972).

- Unfortunately government data are:

  - Out-of-date: the latest available data are 5 years old in some cases.

  - Inconsistent: often different departments, or even different bureaus within one department, publish different values for the same variable.

- Also provided for each industry sector are:

  - Information on the use of EDP in general.

  - Computer services market forecasts.

  - Activities of computer services companies.

## B. DISCRETE MANUFACTURING

### 1. INDUSTRY CHARACTERISTICS

- INPUT estimates 1976 revenues from all sources (shipments plus other revenues) to companies in this sector at over $540 billion.

- Exhibit V-1 shows an industry sector with 12 million employees and over 180,000 establishments (INPUT estimates 150,000 companies).

- Transportation equipment, with relatively few establishments, has 25% of industry sector revenues, as shown in Exhibit V-2.

- Metal and machinery industries have 70,000 establishments and also good size, with combined revenues of $139 billion.

- Printing, with 40,000 establishments, is being completely reshaped by technology.

- In discrete manufacturing, typically 50% to 70% of total assets are controlled by manufacturing and materials management personnel.

### 2. USE OF EDP

- Recent APICS survey shows:

| | |
|---|---|
| - 1961 Computer Users | 15% |
| - 1966 Computer Users | 27% |
| - 1975 Computer Users | less than 80% |

## EXHIBIT V-1

## DISCRETE MANUFACTURING INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $408 BILLION<br>186,000<br>11.6 MILLION |
| 23 | APPAREL | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 30 BILLION<br>23,000<br>1.4 MILLION |
| 25 | FURNITURE | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 12.6 BILLION<br>9,000<br>494,000 |
| 27 | PRINTING | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 33 BILLION<br>40,000<br>1.1 MILLION |
| 31 | LEATHER | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 6 BILLION<br>3,000<br>266,000 |
| 34 | METAL | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 59 BILLION<br>29,000<br>1.6 MILLION |

## EXHIBIT V-1 (CONT'D)

## DISCRETE MANUFACTURING INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 35 | MACHINERY | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 78 BILLION<br>41,000<br>2.2 MILLION |
| 36 | ELECTRONICS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 61 BILLION<br>12,000<br>1.9 MILLION |
| 37 | TRANSPORTATION | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $111 BILLION<br>8,000<br>1.7 MILLION |
| 38 | SCIENTIFIC AND CONTROL INSTR. | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 18 BILLION<br>6,000<br>530,000 |
| 39 | MISCELLANEOUS MANUFACTURERS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 13 BILLION<br>15,000<br>56,000 |
| | | | |

## EXHIBIT V-2

## DISCRETE MANUFACTURING ORGANIZATIONS - DISTRIBUTION BY SIZE

| SIC | INDUSTRY NAME | ANNUAL SALES | | | |
|---|---|---|---|---|---|
| | | < $20 M | $20-100 M | $100-300 M | > $300 M |
| | | SMALL | MEDIUM | LARGE | VERY LARGE |
| 23 | APPAREL | 18,745 | 4,262 | 18 | 9 |
| 25 | FURNITURE | 8,542 | 133 | 8 | 2 |
| 27 | PRINTING | 40,059 | 244 | 22 | 9 |
| 31 | LEATHER | 2,885 | 59 | 2 | 1 |
| 34 | METAL | 28,399 | 363 | 47 | 26 |
| 35 | MACHINERY | 40,063 | 681 | 64 | 61 |
| 36 | ELECTRONICS | 11,548 | 709 | 42 | 41 |
| 37 | TRANSPORTATION | 7,921 | 454 | 29 | 28 |
| 38 | SCIENTIFIC AND CONTROL INSTRUMENTS | 5,770 | 161 | 21 | 14 |
| 39 | MISCELLANEOUS MANUFACTURING | 14,483 | 21 | 12 | 3 |
| | TOTAL | 178,415 | 7,087 | 265 | 194 |

- #1 application - inventory records.

- Secondary applications
  - Order entry
  - Production orders
  - Production schedule

- Computerized Numerical Control (CNC); almost 30% of machine tools are now controlled by minicomputers.

- Direct Numerical Control (DNC), where the CNC minicomputers are connected directly to a central computer, has less than 5% penetration.

- Computer Aided Design (CAD):
  - Major growth in 1980s.
  - General Motors (GM) had a joint venture with IBM for CAD development from 1963 to late 1960s.
  - GM has patent on some CAD software.

- GM use of CAD:
  - Translating measurements from models to engineering drawings had "massive labor impact."
  - Submission of visibility standards to Department of Transportation.
  - Welding design.
  - Crash simulation.
  - Driving numerical controlled tools to make dies.
  - Space/volume calculations.

  - New Vehicle Structural Analysis Program (VSAP) used for road test simulation.

- Benefits to GM:

  - Reduce weight and material use.

  - Reduce labor use, especially expensive engineers doing routine tasks.

  - Introduce new products faster (e.g., Cadillac Seville).

  - Submit data for government regulation.

- DNC, CAD and microprocessor based industrial robots will lead to automated factories in the late 1980s.

## USE OF EDP (EXAMPLES)

- Conversion from service to in-house computer for a company with "called in" catalog sales orders and 24 hour fulfillment:

| FACTOR | BATCH SERVICE | MICRODATA REALITY |
|---|---|---|
| Cost | $3500/Month | $80,000 (Purchase Hardware and Systems Software Only) |
| Applications Processed | Inventory Control Billing | Inventory Control<br>Billing<br>Sales Analysis, etc. |
| Data Preparation | Off-Line Cassette, Batch Sent Each Night | On-Line, CRTs Prompted, Data Validated |
| Output | Picked Up Each Morning<br>Error Correction Took Several Cycles | Available Each Morning<br>Most Errors Corrected Immediately |

- Reasons for conversion:
  - Reduced errors in order fulfillment.
  - Reduced lead time to order fulfillment.
  - Easier and faster data entry.
  - Cost not a major factor.
- To compete, processing services vendor needed to provide:
  - On-line order entry and validation.
  - Prompted data entry through CRTs.
  - Full range of applications.
  - High speed output on-site and on-line inquiry.
  - Total cost $4,000-$6,000 per month.

## USE OF EDP (IMPORTANCE OF ON-LINE, CRT-BASED SYSTEMS)

- Koehring Division:
  - Inventory control (225 programs/4 person years to develop).
  - On-line CRTs for order entry, purchase entry, etc.
  - Benefits: Replace keypunching.
    Move data entry problems to originating department.
    Handle inquiries speedily.

- Wilson Sporting Goods - On-line order entry system:

| OLD SYSTEM | NEW SYSTEM |
|---|---|
| - Orders prepared at customer then keypunched | - Orders called in to on-line CRT operator |
| - 30% reject rate | - Less than 2% reject rate with on-line editing |
| - Billing 14/15 days behind | - Same day |
| - 40/50 keypunchers | - 8 keypunchers |
| - Product management data weeks out-of-date | - Product management data up-to-date |
| - Order status out-of-date | - Order status current |
| - Sales analysis 14 days to field | - Sales analysis 3 days to field |

- Fisher Price:
  - On-line CRT order entry system.
  - Error rate reduction on orders, status and shipments.
  - Order handling time reduced from 3 to 4 days to 1 day.

- Bendix (division with 120,000 shipments per month):
  - On-line CRT order entry system.
  - Gave same-day shipment capability.
  - Receiving/shipping/accounting also on-line.

- Plough Products:

  - On-line CRT order entry system.

  - Reduced inventory to sales ratio.

- Impact for computer services companies: For manufacturers on-line order entry with CRTs is a mandatory requirement for future success. Use of on-line order entry systems using CRTs will spread from sophisticated companies. In order to meet manufacturers' requirements in this area, processing services companies will have to offer similar systems.

## 3. COMPUTER SERVICES MARKET FORECAST

### General Business Processing

- The market will more than double in 5 years, as shown in Exhibit V-3.

- Most of the growth will come from remote computing services, primarily to large companies:

  - Financial services such as budgeting and cash management.

  - Market research and planning.

  - Human resources services where heavy unionization and exposure to government regulation create this market opportunity.

- Revenues from small establishments for payroll and general accounting will continue to rise:

  - This is primarily batch business.

  - Almost every general business service vendor in the country obtains 10-20% of its business in this area.

EXHIBIT V-3

## COMPUTER SERVICES MARKET FORECAST FOR DISCRETE MANUFACTURING, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/ 76 % | 1979 | 1982 | AAGR 1977/ 82 % |
| **PROCESSING SERVICES** | | | | | | |
| GENERAL BUSINESS | $ 172 | $ 195 | 13% | $ 270 | $ 365 | 13% |
| SCIENTIFIC & ENGINEERING | 59 | 65 | 10 | 79 | 130 | 14 |
| INDUSTRY SPECIALTY | 153 | 185 | 21 | 265 | 440 | 19 |
| UTILITY | 96 | 105 | 9 | 131 | 175 | 11 |
| TOTAL PROCESSING | $ 480 | $ 550 | 15% | $ 745 | $ 1,110 | 15% |
| SOFTWARE PRODUCTS | 120 | 150 | 25 | 230 | 430 | 24 |
| PROFESSIONAL SERVICES | 170 | 190 | 11 | 230 | 320 | 11 |
| TOTAL | $ 770 | $ 890 | 16% | $1,205 | $ 1,860 | 16% |

($ MILLIONS)

- By 1982 the pure batch portion will be declining rapidly through exposure to:

  - Small business computers.
  - Future microprocessor based functional computers.
  - Office computers performing text and accounting functions.
  - Conversion to RCS using cheap terminals.

- Rapid spread of small business computers and attendant software/operations problems will create a small FM market opportunity for local batch services companies.

Scientific and Engineering Processing

- Large and very large companies are the source of revenues because:

  - Hardware, such as CDC Cyber 176, not available in-house.

  - Software that is unavailable, or would cost too much to put up, in-house.

  - Facilities and tools, such as interactive graphics, not available in-house.

  - Level of service and support for development not available in-house.

- Batch portion of this market will remain constant around $20 million per year:

  - Always be a need for occasional, very large runs by engineering departments.

  - This is spread over a variety of vendors with large computers.

  - Software and support are important in development.

  - Production, the larger market portion, is dependent on price.

- In the RCS market, the leading vendors (CDC, MCAUTO, UCC, UCS, UNA) will continue to offer latest equipment, software, and techniques. They will consolidate their market share.

- Computer assisted design and graphics capabilities will make structural analysis the fastest growing portion of the market.

- Some very large contracts will go in-house but external business of these companies will grow again, while there will be "push-down" to large companies.

- Some FM for large engineering and research groups will be an opportunity for the leading vendors.

Industry Specialty Applications Processing

- Mainline manufacturing applications for services are inhibited by:

    - Lack of suitable software.

    - Need for "customization" for each customer.

    - Requirements for intra-site, multi-station communications using CRTs for status inquiry, work-in-progress reporting and shop floor scheduling.

- Even with answers to these, the market for mainline manufacturing applications services is dampened by:

    - Manufacturing managements' general ignorance of EDP capabilities.

    - Lack of a perceived critical requirement for EDP in most manufacturing areas.

- Facilities management in manufacturing has not been successful because of the above reasons. Also, because of the difficulties of handling multiple, remote sites in large manufacturers.

- Distribution function (order entry, finished goods inventory control, and shipping) is far more susceptible to use of advanced EDP systems, as shown by earlier examples.

- This need for on-line systems will cause rapid growth in RCS to the distribution function in medium and large companies without necessary internal resources.

- Network capabilities, particularly international, will cause some very large companies to use RCS companies for order entry and similar applications

- N/C machine tool services will continue to grow but with some conversion to turnkey systems.

- On-line services such as those offered by XCS and Keydata will be exposed to small business computers in small (less than $20 million annual sales), single location manufacturers.

- Larger ($20-$100 million) multi-site companies will be higher potential provided that:

    - Customization capability is built in.

    - Interfaces with on-site minis on shop floors are provided.

- Secondary applications, such as quality control and environmental control will be prime opportunities for RCS.

- Over the next five years, decentralization of profit-center management and increased knowledge of EDP benefits in the manufacturing environment will create better climate for computer services vendors.

Utility Processing

- Problem solving will push-down to medium-sized companies but account size will be reduced.

- The use of powerful DBMS will enable services companies to grow their utility services in very large companies in the traditional areas of:

    - Finance and planning.

    - Market research.

    - Sales analysis.

    - Management sciences.

- Batch and RCS utility services where users buy time for overflow and to develop and run their own programs will remain fairly constant.

Software Products

- Systems software products are most successful. DBMS use has a high penetration in this sector, particularly IMS.

- Secondary and accounting applications have most success among application products.

- Few mainline manufacturing products are successful. The leading ones are:

    - Production IV from Informatics.

  - MAS from Martin Marietta Data Systems.

- Both are highly modular and customized on installation.

- For small companies IBM's System/32 products are creating a market.

- Turnkey systems in N/C machine tools and other specialized areas are also increasing the software products market.

Professional Services

- Because of the need to customize applications, there are substantial professional services revenues associated with RCS, batch, and software product sales.

- EDP consulting is prevalent at all sizes.

- In larger companies, on-line systems and minicomputer related consulting are growing rapidly.

- Accounting companies are developing on-line financial systems.

## 4. VENDOR ACTIVITIES

- ACTS Manufacturing Control System activities for companies outside Lear-Siegler transferred to Rapidata.

- Boeing Computer Services has licensing agreement to use A.O. Smith manufacturing software, initially in California.

- Apex provides customized manufacturing services based on IBM's CICS. Similar business to Eastern Systems Management based in Philadelphia and recently acquired by ADP.

- Autocomp, providing services to printing and publishing industry, recently merged with CDSI (Washington, D.C.).

- Carter Associates (San Francisco Bay Area):

  - Small ($2 million annual sales) batch services company.

  - Specializes in manufacturing services based on its own software.

  - Customers highly exposed to small business computers/turnkey applications companies.

  - Must tie-in remote computing capability.

- Computer Sciences Corporation, good example of variety of services:

  - Developed manufacturing software for Univac.

  - Agreement with AMD for meta-assembler to build microprograms for target machines (Bell Telephone and Calcomp early clients).

  - Infonet has contract with Gardner-Denver Company for worldwide order entry system.

  - Provides, through Infonet, market analysis and engineering services to $7 million company which tailor makes each system for a client.

- Comserv in Minneapolis provides batch and remote batch services in manufacturing and distribution.

- Comshare has a $1 million timesharing FM contract with A.B. Dick.

- CDC provides design analysis and testing of circuits and digital logic boards to electronics manufacturers.

- Standard Computing has built a specialty in quality control systems; customers include Gillette, Hughes Aircraft, Honeywell, and Polaroid.

- General Electric Information Services provides a variety of remote computing services to manufacturers:

    - Remote FM to another GE division.

    - Utility services such as worldwide support for Gillette market research panel.

- Manufacturing Data Systems, Inc:

    - Has 60% of N/C machine tool RCS market. Of 20,000 machine tools eligible for CNC, 10,000 are using it, and MDSI supplies 6,100 of them.

    - Provides services using dedicated XDS 940s from Tymshare and Comshare.

    - 80% of its $22 million 1977 revenues come from this source.

    - Now offering turnkey systems, and MDSI ACTION CENTRAL, for $3,000 per month.

- MCAUTO provides services to manufacturing functions in large companies:

    - Has United Computing Corporation acquisition for N/C and CAD/CAM services and systems.

    - Provides IMS based MRP for which American Honda is a client; software available in $20,000/$30,000 range.

  - Distribution system (also IMS based) called Co-op; used by Hamilton Standard.

- NCR bought Data Pathing for shop floor data collection - could tie-in to revamped service centers for medium/small manufacturers.

- Optimum Systems, Inc. has Basic Manufacturing System for small companies which has not been very successful (revenues under $1 million).

- Tymshare provides Magnum-Opus, an MRP package written using a powerful, proprietary DBMS. Its success as a stand-alone product is yet to be measured.

- UCC provides APT-based N/C services through remote batch and, more recently, turnkey systems. It is probably second to MDSI in this arena.

- Xerox Computer Services has just acquired Arista, Inc., a vendor of manufacturing software.

- In the turnkey systems area:

  - Algorex is providing APT services and interactive graphics systems like UCC.

  - Artronix uses "MUMPS," a powerful on-line data management system developed for hospital applications, for manufacturing/distribution systems.

  - SDC provides a turnkey system for printing and publishing (Text II) which has been one of its most successful ventures into commercial business.

## C. PROCESS MANUFACTURING

### 1. INDUSTRY CHARACTERISTICS

- With 8 million U.S. employees (compared to 12 million in discrete manufacturing), process manufacturing has 20% higher value of shipments than discrete manufacturing, as shown in Exhibit V-4.

- The sector is dominated by food products industry with nearly 80,000 establishments and $181 billion in shipments.

- Within food products, major industries and their annual shipments are:

  - Meat and poultry, $48 billion.

  - Bakery products, $14 billion.

  - Fats and oils, $13 billion.

  - Canned and frozen foods, $11 billion.

  - Alcoholic beverages, $10 billion.

  - Soft drinks, $8 billion.

- The tobacco industry has largest value of shipments per establishment, an average of $18 million, closely followed by petroleum with $17 million.

- Paper products, chemicals, and rubber and plastics have good target industry characteristics in terms of organization size and numbers, as shown in Exhibit V-5.

EXHIBIT V-4

### PROCESS MANUFACTURING INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $486 BILLION<br>133,000<br>8 MILLION |
| 10 | METAL MINING | VALUE OF SHIPMENTS (1972)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 3.5 BILLION<br>800<br>84,000 |
| 11 | ANTHRACITE MINING | VALUE OF SHIPMENTS (1972)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $130 MILLION<br>200<br>5,000 |
| 12 | COAL MINING | VALUE OF SHIPMENTS (1972)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 5.4 BILLION<br>3,400<br>162,000 |
| 13 | OIL AND GAS EXTRACTION | VALUE OF SHIPMENTS (1972)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 24 BILLION<br>13,000<br>240,000 |
| 20 | FOOD PRODUCTS | VALUE OF SHIPMENTS (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $181 BILLION<br>25,000<br>1.5 MILLION |

EXHIBIT V-4 (CONT'D)

PROCESS MANUFACTURING INDUSTRY SECTOR -

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 21 | TOBACCO | VALUE OF SHIPMENTS (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 5.4 BILLION<br>300<br>70,000 |
| 22 | TEXTILE PRODUCTS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 31 BILLION<br>7,000<br>975,000 |
| 24 | LUMBER AND WOOD PRODUCTS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 28 BILLION<br>31,000<br>709,000 |
| 26 | PAPER PRODUCTS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 33 BILLION<br>6,000<br>647,000 |
| 28 | CHEMICALS | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 65 BILLION<br>11,000<br>892,000 |
| 29 | PETROLEUM | VALUE OF SHIPMENTS (1973)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES | $ 35 BILLION<br>2,000<br>142,000 |

## EXHIBIT V-4 (CONT'D)

## PROCESS MANUFACTURING INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 30 | RUBBER AND PLASTICS | VALUE OF SHIPMENTS (1973) | $ 24 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 9,000 |
| | | NUMBER OF EMPLOYEES (1974) | 699,000 |
| 32 | STONE, GLASS, CLAY | VALUE OF SHIPMENTS (1973) | $ 24 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 16,000 |
| | | NUMBER OF EMPLOYEES (1974) | 672,000 |
| 33 | PRIMARY METALS | VALUE OF SHIPMENTS (1973) | $ 73 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 7,000 |
| | | NUMBER OF EMPLOYEES (1974) | 1.3 MILLION |
| | | | |
| | | | |
| | | | |

EXHIBIT V-5

PROCESS MANUFACTURING ORGANIZATIONS -

DISTRIBUTION BY SIZE

| SIC | INDUSTRY NAME | ANNUAL SALES | | | |
|---|---|---|---|---|---|
| | | < $20 M | $20-100 M | $100-300 M | > $300 M |
| | | SMALL* | MEDIUM* | LARGE** | VERY LARGE** |
| 10 | METAL MINING | 770 | 213 | 14 | 17 |
| 11 | ANTHRACITE MINING | 230 | - | - | - |
| 12 | BITUMINOUS COAL AND LIGNITE MINING | 3,364 | 50 | - | - |
| 13 | OIL AND GAS EXTRACTION | 13,293 | 23 | 4 | 6 |
| 20 | FOOD AND KINDRED PRODUCTS | 24,971 | 277 | 60 | 75 |
| 21 | TOBACCO MANUFACTURERS | 276 | 17 | 2 | 5 |
| 22 | TEXTILE MILL PRODUCTS | 6,500 | 415 | 21 | 15 |
| 24 | LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE | 31,253 | 70 | - | - |
| 26 | PAPER AND ALLIED PRODUCTS | 5,735 | 162 | 26 | 31 |
| 28 | CHEMICALS AND ALLIED PRODUCTS | 10,814 | 244 | 35 | 67 |
| 29 | PETROLEUM REFINING AND RELATED INDUSTRIES | 1,976 | 22 | 9 | 28 |
| 30 | LEATHER AND LEATHER PRODUCTS | 9,273 | 179 | 10 | 8 |
| 32 | STONE, CLAY, GLASS, AND CONCRETE PRODUCTS | 15,691 | 166 | 18 | 15 |
| 33 | PRIMARY METAL INDUSTRIES | 6,506 | 364 | 30 | 35 |
| | TOTAL | 130,652 | 2,202 | 229 | 302 |

* NUMBER OF ESTABLISHMENTS **NUMBER OF ORGANIZATIONS

## 2. USE OF EDP

- On-line, CRT-based, order entry systems are as important in this sector as in discrete manufacturing.

- In the food industry, with its perishable commodities, order entry and inventory control are critical.

- Apart from the petroleum industry, most industries in this sector are "under-computerized."

- Management science and operations research techniques are prevalent in this sector:

  - Mixing and movement of materials in process lends itself to simulation.

  - Delivery and distribution of bulk materials require careful scheduling.

- Petroleum industry:

  - EDP expenditures by oil companies $2 billion (1976), increasing to $3 billion (1982).

  - Exploration and production account for 55% of EDP expenditures.

  - In exploration seismic data reduction, reservoir modeling and production forecasting are prime applications.

  - In production, well-head reporting for state and federal governments is increasingly important.

  - Pipeline volume accounting and billing are key factors in transportation.

  - In refining, LP techniques are used for simulation and refinery performance optimization: energy consumption, waste control and pollution control applications are all of increasing importance.

  - R&D activities related to refineries are highly classified EDP work.

  - Only 10% of EDP is devoted to marketing, distribution, retail, and routine accounting functions; credit operations are included here.

  - Apart from credit card authorization and processing, there is little accounting related to gas station business.

  - Retail fuel oil operations do use EDP for accounting.

- Food processing:

  - EDP use lags other industries.

  - Company management views EDP as a cost and not a business contributor.

  - As this attitude changes, EDP opportunities will expand rapidly.

  - EDP is still primarily used for accounting applications.

  - Inventory control, production control and order entry are secondary applications.

  - Many companies are still using decentralized data processing. EDP expenditures average 0.3% of sales for food processing firms.

  - The level of EDP stature is evidenced by high turnover of EDP managers in this industry.

## 3. COMPUTER SERVICES MARKET FORECAST

### General Business Processing

- Centralization in larger companies will cause some reduction in general business revenues to services companies from decentralized small establishments.

- However, the dispersed nature of industries in this sector will cause batch processing and batch/RCS combinations to continue to grow with small establishments, as shown in Exhibit V-6.

- Remote computing services for financial, market research, and personnel applications will be major growth areas in large companies.

- Financial consolidation and cash management services are high potential in this industry sector because of the geographic dispersion of establishments in an enterprise.

### Scientific and Engineering Processing

- Metal manufacturers use a variety of engineering packages for heat flow, piping, stress analysis, and structural design.

- The petroleum industry accounts for almost half of scientific and engineering processing in this sector. This growth will continue at 16% per year despite transfer of applications in-house in certain cases.

- CDC computers are mandatory for scientific processing in the petroleum industry. One oil company will only use a vendor which has a CDC 6600 for its reservoir simulation model. This model requires three hours of "run" time for every year of reservoir history being simulated.

EXHIBIT V-6

## COMPUTER SERVICES MARKET FORECAST FOR PROCESS MANUFACTURING, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 66 | $ 75 | 14% | $ 97 | $ 143 | 14% |
| SCIENTIFIC & ENGINEERING | 37 | 40 | 8 | 50 | 73 | 12 |
| INDUSTRY SPECIALTY | 97 | 115 | 19 | 160 | 272 | 19 |
| UTILITY | 85 | 100 | 16 | 128 | 177 | 13 |
| TOTAL PROCESSING | $ 285 | $ 330 | 15% | $ 435 | $ 665 | 15% |
| SOFTWARE PRODUCTS | 62 | 70 | 13 | 110 | 190 | 20 |
| PROFESSIONAL SERVICES | 105 | 110 | 5 | 120 | 175 | 9 |
| TOTAL | $ 452 | $ 510 | 13% | 665 | 1,030 | 15% |

($ MILLIONS)

- In the food industry, blending applications using LP are a target market. Feed blending, sausage blending, butchering, and milk utilization all can make use of this technique:
    - Use is restricted by lack of vendor understanding of the food processing business.
    - Also, few users are willing to spend necessary research dollars to provide the interfaces.
- As well as the large RCS vendors with CDC equipment, the LP market is served by specialty firms such as Nelson Associates in Indiana and Computone in Atlanta.

Industry Specialty Processing

- In the food industry, order entry accounts for 50% of the industry specialty processing market. The major problem of data entry from "uncontrolled" salesmen requires an interactive, call-in, or voice response system. Order entry services are provided by Wiltek, GEIS, SBC, and National CSS.
- Route accounting for dairy, bakery, and beverage manufacturers accounts for approximately 25% of the food industry specialty market. Route accounting has immediate and obvious pay-offs to financial management.
- Other food industry specialty applications are as follows:
    - Because of date of sale restrictions, returned good analysis is a rapidly growing opportunity.
    - In purchasing, hedging against commodity price swings is a highly specialized and limited market opportunity.

  - Grower contract management for food manufacturers is a specific remote computing specialty opportunity.

- In petroleum, the main specialty activity is seismic data processing in remote batch and batch mode. Batch processing of linear programming models for refinery modeling and transportation is also significant.

- Facilities management operations are varied: National Data has a $14 million FM contract with ARCO for credit card processing. Other contracts are small and medium companies such as those of Kerr Glass and Armstrong Cork with Eastern Systems Management.

- Econometric planning services from companies such as DRI, Chase/ADP, and Wharton/BCS are heavily used by petroleum companies.

Utility Processing

- The majority of utility processing is remote computing services used by multitudes of departments in very large petroleum and other companies.

- Because of wide fluctuations in EDP demand, much overflow processing is done by even the largest petroleum companies. For example, American Petrofina (a billion dollar company) uses LTV or UCC in Dallas to run large refinery models in batch mode when needed; it does all its other processing on an IBM System/360 Model 30.

- Also in petroleum and metal processing companies, departments such as financial planning and market research use the tools remote computing services supplies.

- Network consolidation of financial and production reports is prevalent in petroleum and some food industry areas such as soft drink manufacturing.

- The large budgets of various decentralized departments in petroleum companies make this industry a prime target for utility processing. Another factor favoring services is that there are many sophisticated and knowledgeable people, in an EDP sense, in these departments.

- Utility processing for the petroleum industry is $22 million per year, 25% of the 1976 process manufacturing total. Of this, approximately half is interactive and the other half is batch and remote batch.

- Turnaround time and availability of sophisticated products are key factors in the growth of the utility services business here.

Software Products

- Process manufacturers have not been a good market for application packages.

- Two-thirds of the $50 million software market is for systems packages, mostly in very large installations. Data base management systems products and productivity products are readily acceptable in large installations in these industries.

- Turnkey systems packages such as those for well-head accounting will increase rapidly because of decentralized purchase points.

- Applications products in petroleum industry will double in market size from $6 million in 1976 to nearly $15 million in 1982. Suppliers include:

    - Bell and Murphy

    - Bonner and Moore

    - Digicon

    - Geoquest

- Intercomp Resource Development and Engineering

- Profimatics

- Swanson Analysis Systems, Inc.

- Swan and Wooster Engineering Company

Professional Services

- Process manufacturers tend to use relatively little general professional services.

- Food industry and some "backward" EDP industries are making increased use of development services from accountants and others.

- Large centers such as those in the petroleum, metals processing, and chemical industries are major users of specialty consulting in areas such as computer performance evaluation and network design.

- These installations also spend relatively heavily for education services.

- Overall there is a strong tendency for companies in this industry sector to keep work in-house. Decentralization, however, tends to create opportunities, primarily for consulting.

## 4. VENDOR ACTIVITIES

- In the petroleum industry:

  - Small, local, service bureaus, like Management Research Consultants, get significant revenues from small, volatile, oil and gas exploration and production companies.

  - CDC, UCC, UCS, and MCAUTO are prime vendors for scientific calculations. Much of the work performed is utility processing because of the skill of the users in developing and using their own systems.

  - A large share of the processing services market comes from services based on software from companies, such as engineering companies, whose main business lies outside data processing.

  - There are over 200 RCS sales and support personnel in the Houston/Dallas areas concentrating on the petroleum industry. Specialty processing companies in the Houston/Dallas area include:

    - Chemshare
    - Engineering Numerics
    - Garrett Computing Systems
    - Petroleum Software
    - Seiscom Delta
    - Spenko Systems Division of Dresser Industries

  - Major companies specializing in services to the petroleum industry are BCS, CDC, CSC, GEIS, Itel (Utility Network of America), MCAUTO, Tymshare, UCC, and UCS.

- BCS is the prime EDP contractor on the Alaska pipeline with a remote batch management system.

- Bonner and Moore is an 80 person company owned by Fluor Corporation that:

  - Consults to the petrochemical refining industry.

  - Sells raw time and does custom programming.

  - Has a linear programming expertise and a set of software packages of its own design which it provides on a royalty basis to other processing services vendors.

- Brown and Root, with revenues exceeding $5 billion, has a computer services subsidiary for the petroleum industry.

- R. W. Byran and Company (Austin, TX) specializes in computer services for government reporting in the petroleum industry; this is a major growth area. In conjunction with the University of Oklahoma, it provides data bases on oil.

- Chemshare Corp. is an industrial engineering company which provides simulation programs for gas, chemical, refining and petrochemical activities. CDC, UCC, and UCS use its products.

- Computer Sciences/Infonet has professional services contracts using proprietary languages with:

  - Jewell Foods for sales analysis.

  - Kraft Foods for quality control reporting.

- CDC has a petroleum service firm in Houston.

- CDC Cybernet offers programs for process/planning engineers in energy planning, petrochemical processing, and metal production; optimization algorithms are a key.

- Digicon is a $25 million company providing seismic data collection and processing. Digicon is a good example of a service where EDP is inseparable from the major product.

- Engineering Numerics Corporation is a partnership of Core Labs and CDC; it offers a library of scientific applications for the oil and gas industry.

- Garrett Computing Systems (Dallas, TX) provides services using its proprietary software products and the processing of other vendors, such as GEIS. Garrett specializes in petroleum engineering and economics. "The Garrett package" is also available from GEIS, UCS, and UCC.

- GEIS has major emphasis in the petroleum industry; products include:

  - Petroex, a complex product movement and inventory system provided by the Williams Pipeline Company.

  - Petroleum Data System, a data base on oil/gas fields constructed by the University of Oklahoma under contract to the U.S. Geological Survey.

  - POGO (Profitability of Oil and Gas Opportunities), consolidation for major companies.

- GEIS network is used by petroleum companies for national and international data consolidation. It is also used by soft drink bottlers, such as Coca Cola, for similar purposes.

- In the food industry, GE provides a containerizing and palletizing program, as well as order entry services.

- K&H Computer Systems, Inc. (London) offers Proplan running on a CDC 6600 for project management.

- MCAUTO provides a variety of petrochemical specialized applications.

  - Simulation programs jointly developed by Phillips Petroleum and Simulation Sciences.

  - Compaid developed in England by B.A. Computer Services, Ltd.

  - Standard engineering packages.

- National Data has a $14 million FM contract with ARCO for credit card authorization and processing.

    - Other petroleum credit card authorization services total to $0.8 million.

    - Other credit card processing is $1 million.

- National Data is also collecting billing data on-line from gas pumps operated by Atlantic Richfield and Amoco.

- National CSS has a development and processing contract with Kame-Miller Corporation, a half-billion dollar food processor with virtually no EDP until recently.

- Petroleum Data Corporation (with Petrodata) processes 600,000 retail accounts for home heating delivery.

- Petroleum Information Corporation, subsidiary of A. C. Nielsen Company, provides publications to oil clients based on its IBM 360/145.

- Petroleum Software, Inc. has its services provided through Univac 1108 based companies such as UCC, Intertek (Huntsville), and Utility Network of America (Itel).

- Profimatics, an engineering services firm in Woodland Hills, CA, offers Generalized Refining Transportation Market Planning System (GRTMPS) to generate LP models and other specialized processing for petroleum companies.

- Seiscom Delta is the largest independent seismic data acquisition and processing company. One-third of its employees are in EDP.

- Swanson Analysis Systems, Inc. only has one product, ANSYS, licensed on a royalty basis. Of the 200 companies using ANSYS, 40 are in the petrochemical industry.

- Swan and Wooster Engineering Company has GASP which is exclusively available on CSC's Infonet.

- Tymshare has a petroleum district office in Houston offering generalized service and products to the industry. Particular emphasis on data management enables Tymshare to have good penetration in utility marketplace.

- Tymshare's Data Services Division offers Computafuel to oil dealers for fuel distribution.

- UCC's SED supports the construction activities in the hydrocarbon industries, petroleum and chemical. Abilities stretch from conceptual modeling of a refinery through engineering analysis to design.

- UCC's 50 users make it a major supplier of computer services in the petroleum area. Its support is ranked highly by clients.

- UCS also specializes in medium and large oil companies. Major product is SACM used for reservoir volumetric calculations and contour mapping. It also offers the Garrett package on its CDC equipment.

- USS Engineers and Consultants offers structural analysis and other programs to metal manufacturers based on a CDC 6500 and Honeywell 6080.

## D. TRANSPORTATION

### 1. INDUSTRY CHARACTERISTICS

- Motor carriers of property and passengers have 33% of the operating revenues in this industry sector. They also dominate in terms of number of establishments, as shown in Exhibit V-7.

- In motor freight, approximately 1500 carriers account for almost $20 billion in operating revenues.

- These carriers own 600,000 vehicles.

- Railroads have 23% of the operating revenues and scheduled air carriers 20%.

- Of the very large companies, however, the distribution is even. "Fortune 50" transportation companies include:

    - 16 airlines.

    - 16 railroads.

    - 14 motor freight companies.

    - 4 marine companies.

- In total, these 50 companies had $42 billion operating revenues in 1976.

- The performance of airlines has picked up dramatically in the last several years.

- Railroads also have improved their performance. The top "Fortune 50" companies in earnings in 1976 were all railroads.

# EXHIBIT V-7

## TRANSPORTATION INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | OPERATING REVENUES (1974) | $ 74 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 129,000 |
| | | NUMBER OF EMPLOYEES (1974) | 3.2 MILLION |
| 40 | RAILROADS | OPERATING REVENUES (1974) | $ 17.8 BILLION |
| | | NUMBER OF OPERATING COMPANIES (1974) | 341 |
| | | NUMBER OF EMPLOYEES (1974) | 541,000 |
| 41 | LOCAL AND SUBURBAN TRANSIT | OPERATING REVENUES (1974) | $ 1.4 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 13,000 |
| | | NUMBER OF EMPLOYEES (1974) | 317,000 |
| 42 | MOTOR FREIGHT | (NOT REGULATED BY ICC) | |
| | | OPERATING REVENUES (1972) | $ 7.8 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1972) | 63,000 |
| | | NUMBER OF EMPLOYEES (1972) | 328,000 |
| | | (REGULATED BY ICC: CLASS 1) | |
| | | OPERATING REVENUES (1973) | $ 16.6 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1973) | 1,500 |
| | | NUMBER OF EMPLOYEES (1973) | 580,000 |

EXHIBIT V-7 (CONT'D)

TRANSPORTATION INDUSTRY SECTOR -

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 43 | U.S. POSTAL SERVICE | OPERATING REVENUES (1975)<br>NUMBER OF POST OFFICES (1975)<br>NUMBER OF EMPLOYEES (1975) | $ 11.6 BILLION<br>31,000<br>702,000 |
| 44 | WATER TRANSPORTATION | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $880 MILLION<br>5,900<br>185,000 |
| 45 | AIR TRANSPORTATION | OPERATING REVENUES (1975)<br>NUMBER OF AIR CARRIERS (1975)<br>NUMBER OF EMPLOYEES (1974) | $ 15 BILLION<br>33<br>346,000 |
| 46 | PIPELINES | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 1.6 BILLION<br>350<br>20,000 |
| 47 | TRANSPORTATION SERVICES | OPERATING REVENUES (1972)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 1.4 BILLION<br>14,000<br>133,000 |
|  |  |  |  |

- A characteristic of transportation companies is their multiplicity of operating centers and requirement for communications.

- Railroads typically use their rights of way for their own communication systems.

- In some cases, such as with Southern Pacific, they have ventured to sell these communications services commercially.

- Pipelines also have this facility.

- Airlines have a unique communications supplier in ARINC in Maryland which packages communications lines for them.

- In motor freight, the American Trucking Association tried to set up a similar operation several years ago and failed. However, this may well come up again.

## 2. USE OF EDP

- Airlines have generally the largest and most sophisticated computer/communications systems.

- The need for on-line and on time reservation and scheduling systems has caused them to become most sophisticated users.

- Airlines provide processing services to other airlines, particularly to foreign carriers operating in the U.S. Such services are often 'bundled' with other services, such as airframe maintenance.

- There is a trend, however, for sophisticated airlines to reduce the services and software they will sell to other airlines because of the competitive advantage that can be obtained from such products and services.

- This provides an opportunity for services companies, provided, however, they can get the very expensive software necessary. Joint ventures with second-tier airlines are probably the way to obtain this software.

- Railroads have large centralized data processing activities which tend to be relatively unsophisticated and very parochial. The American Railroad Association has a set of software packages that it makes available to processors or railroads.

- In motor freight, 50% of large truckers (Class I, with sales over $3 million) now have in-house EDP, according to the American Trucking Association.

- All others use computer services to a greater or lesser degree.

- On-line CRT systems are extremely important for large trucking companies in rating and billing activities.

- These CRTs usually are based in a central location with communications from outlying freight terminals made by telephone call-in.

- However, this is changing and remote computer terminals are being installed in freight terminals.

- Motor freight is generally an under-developed data processing industry. Because of the lack of management sophistication, computer services growth in this industry has not matched expectations.

- The marine industry is so backward in its use of data processing systems that the Maritime Administration has had to fund the development of systems to support the shipping lines' operations.

- Unionization is a major force in all transportation industries and includes the data processing function in many cases.

## 3. COMPUTER SERVICES MARKET FORECAST

### General Business Processing

- General business revenues stem from payroll activities for motor freight companies and basic accounting, primarily batch.

- There are some remote computing budgeting and financial services to airlines and railroads.

### Scientific and Engineering Processing

- A small amount of scientific and engineering processing is performed by airlines and railroads for simulation and engineering, including a small amount of design.

### Industry Specialty Applications Processing

- Industry specialty applications account for over half of the processing services revenues in this industry sector, as shown in Exhibit V-8.

- Of this, airlines account for approximately 60% ($30 million), motor freight companies for 30% ($15 million), and railroads for less than 10% (under $5 million).

- Airlines provide virtually all of the facilities management activity in this industry sector, with some motor freight.

- A key application in motor freight is freight billing. This requires a sophisticated message switching capability from remote freight terminals.

- Major processing services to the trucking industry are batch services for:

  - Fleet maintenance.

EXHIBIT V-8

## COMPUTER SERVICES MARKET FORECAST FOR TRANSPORTATION, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 17 | $ 20 | 18% | $ 27 | $ 43 | 17% |
| SCIENTIFIC & ENGINEERING | 5 | 5 | 0 | 5 | 5 | 0 |
| INDUSTRY SPECIALTY | 55 | 65 | 18 | 95 | 167 | 20 |
| UTILITY | 22 | 25 | 15 | 33 | 45 | 12 |
| TOTAL PROCESSING | $ 99 | $ 115 | 16% | $ 160 | $ 260 | 17% |
| SOFTWARE PRODUCTS | 25 | 30 | 18 | 35 | 60 | 15 |
| PROFESSIONAL SERVICES | 21 | 24 | 15 | 30 | 40 | 11 |
| TOTAL | $ 145 | $ 169 | 17% | $ 225 | $ 360 | 16% |

($ MILLIONS)

  - Driver and vehicle scheduling.

  - Vehicle acquisition analysis.

  - ICC rate applications support.

- In this context, speed regulations of 55 M.P.H. have increased the importance of driver and vehicle scheduling. Police "crack-downs" on speeding by drivers make the scheduling problem highly visible.

- Rating is a key problem and continuing opportunity in the transportation industry in general and the trucking industry particularly.

- Data collection and analysis for cost/performance determination continues to be an opportunity for computer services companies.

- Rate applications support is directly usable by transportation companies and an effective product or service in this area is probably the most easily saleable.

### Software Products

- The software products marketplace to transportation is evenly divided between applications products and systems products.

- Systems products are sold primarily to large airline and railroad centers.

- The airline industry also accounts for a significant portion of applications package sales. These are primarily for a few, large-ticket systems; the Eastern Airlines version of PARS, for example, sells for over $1 million.

### Professional Services

- Use of professional services is widely distributed in the transportation industries.

- Transportation companies tend to do their own software development, except for financial systems, which are often developed by accounting companies.

- In terms of use of software development services, airlines rank first, railroads second, and motor freight companies third.

## 4. VENDOR ACTIVITIES

- Railroad companies are more likely to be vendors of computer services than users. For example:

    - Rio Grande Industries in Denver has a data processing subsidiary.

    - Kansas City Southern has a very successful subsidiary, Data Systance, which provides services to mutual funds and bank trust departments.

- Lockheed's service corporation is one of the few independents providing specialized services to airlines. It provides flight planning services, as does PRC Computer Center, Inc., a subsidiary of Planning Research Corporation.

- Mutual Computer Services, Continental Airlines DP subsidiary, is probably the largest supplier of computer services to other airlines, with sales of over $5 million a year. Continental provides flight planning services to 20 airlines and reservation services to 12 airlines. It interfaces with AMEX's worldwide hotel reservation system.

- Because of non-airline sales, Eastern Airlines is a larger computer services vendor than Mutual Computer Services, with sales of over $7 million in 1976. It has a large contract with CIT Finance, for example, for development and operations of the CITATION system connecting CIT financial offices.

- Other airline computer services vendors include American, Braniff, Delta, Frontier, and Pan-American. United Airlines has removed itself from the marketplace.

- In motor freight, Confax in New York offers message switching and freight bill processing:

  - Other applications include billing, rating, tracing and equipment control.

  - Basic services cost $4,000 per month.

  - Turnkey system costs $500,000.

- CDC offers a trucking accounting service. It is one of the leading vendors of computer services in the trucking industry.

- CDC had an agreement with Lee Way Motor Freight whereby CDC marketed a system to other carriers based on a CDC 3300 operated at Lee Way.

- CDC also had an agreement with Transportation Data Services of Phoenix, Arizona, for the marketing of TRAFFIC, a service for motor carriers in the $1-13 million size category.

- Itel, through Transportation Management Services in Utah, is the other major supplier and offers COBIS, an on-line billing system.

  - Intended for carriers with central rating operations.

  - Provides a message switching and data collection facility, and accounting reports.

  - Intended for larger carriers with over $20 million per year in revenues.

- Datronics provides billing, revenue accounting, and other services to customers in the South and Texas.

- Several motor freight carriers are selling programs or services to other companies in the industry.

- There are a few companies providing turnkey systems to trucking organizations, including Transportation Management Systems in Maryland, and Basic/Four Corporation.

- In the marine industry, Marine Management Systems offers a data base on ships through GEIS. It also offers consulting and software packages.

## E. UTILITIES

### 1. INDUSTRY CHARACTERISTICS

- Two-thirds of the industry sector revenues go to 6,000 electric and gas power establishments, with one-third of total employees, as shown in Exhibit V-9.

- Publicly owned electric power utilities number 1,500 and account for 20% of total capacity; they have no nuclear capability.

- National Rural Electric Cooperative Association represents 1,000 small electrical utilities.

- The "Fortune 50" companies account for 60% of total revenues -- the sector is not as concentrated as is generally thought.

- AT&T, with its more than 20 operating companies, dominates the communications industry; only three other telephone companies are in the "Fortune 50."

- Telephone company construction costs are over $12 billion per year.

- Broadcasting industry, although relatively small, is growing at 18% per year.

### 2. USE OF EDP

- Large utilities have massive, centralized, data processing departments.

- In the communication industry, these will increase rapidly in EDP equipment use:

  - 1976/77 equipment budgets reportedly will increase 19%, primarily for mainframe acquisition.

## EXHIBIT V-9

## UTILITIES INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $124 BILLION<br>21,000<br>1.8 MILLION |
| 481 | TELEPHONE COMMUNICATIONS | OPERATING REVENUES (1974)<br>NUMBER OF COMPANIES (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 34 BILLION<br>1,700<br>981,000 |
| 482 | TELEGRAPH COMPANIES | OPERATING REVENUES (1974)<br>NUMBER OF COMPANIES (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 0.8 BILLION<br>7<br>14,500 |
| 483 | RADIO AND TV BROADCASTING | OPERATING REVENUES (1974)<br>(1976)<br>NUMBER OF STATIONS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 6.2 BILLION<br>$ 8.5 BILLION<br>5,600<br>143,000 |
| 489 | COMM. SERVICES N.E.C. | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 1.0 BILLION<br>2,200<br>35,000 |
| 491 | ELECTRIC SERVICES | OPERATING REVENUES (1975)<br>NUMBER OF PLANTS (1975)<br>NUMBER OF EMPLOYEES (1974) | $ 47 BILLION<br>3,600<br>340,000 |

## EXHIBIT V-9 (CONT'D)

## UTILITIES INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 492 | GAS PRODUCTS AND SERVICES | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 15 BILLION<br>1,800<br>113,000 |
| 493 | COMBINATION GAS AND ELECTRIC | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 19 BILLION<br>770<br>135,000 |
| 494 AND 495 | WATER SUPPLY AND SANITATION | OPERATING REVENUES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 1 BILLION<br>5,500<br>50,000 |
| | | | |
| | | | |
| | | | |

  - AT&T has ordered many IBM 3033s as well as Amdahl computers.

- Demand for on-line customer information systems and new billing systems is pushing EDP use.

- In both communications and power industries, CRT-based systems are being installed for customer inquiry and service.

- Relations with the public and regulatory agencies result in a high priority for these systems.

- Federal and state regulations in environmental and safety areas are creating massive recordkeeping and reporting system requirements for power companies.

- Variances in demand, fuel availability, and prices are increasing requirements for planning and simulation models.

- Nuclear plant construction programs are leading directly to EDP equipment acquisition.

- Other key applications are material management, inventory control, and plant record systems.

- Data processing departments primarily support business and operations functions; engineering and construction receive less attention from them.

- Although large, the bureaucratic nature of utilities renders their system development performance relatively poor.

- In the Bell system, Bell Labs. is a developer of software and systems for the operating companies.

- Bell Labs. and Western Electric also offer processing services to the operating companies.

- Attitudes to EDP at top management levels are not supportive: a "necessary tool" is the best prevailing attitude.

- Executives and EDP managers would strongly prefer to do all processing in-house.

- AT&T would like to move away from dependence on IBM; the operating companies will resist that.

- In the broadcasting industry, many stations lack rudimentary systems:

    - New line managers are poorly trained and generally ignorant of EDP, even in the chains of stations.

    - As professional management moves in, opportunities for EDP will increase rapidly.

- Water and sanitation is primarily a municipal service and EDP revenues are counted there.

- In the gas, electric, and water industries, electronic meter reading and control will emerge in the next 5 years.

- In Omaha, for example, ERDA has a demonstration system operational using a $3.50 encoder linked to a transponder for water meter reading.

- Control over use requires bi-directional communication and more expensive units. Energy shortages, either real or apparent, will push this development.

## 3. COMPUTER SERVICES MARKET FORECAST

- This industry sector is a relatively large user of processing services among larger companies.

- Electric power utilities are heavy purchasers of nuclear code and structural systems for nuclear plant construction:

    - Present slowdown in construction reduces this demand.

    - Increased environmental and safety concern increases this demand.

    - U.S. energy policy will boost this demand even further.

- Because of geographic concentration, network facilities are relatively unimportant in this sector.

- Engineering departments in communications and power companies are relatively free to obtain their processing services outside -- cost, reliability and turnaround are key criteria for choice.

- About 30% of processing expenditures are for scientific and engineering processing, as shown in Exhibit V-10.

- A further 20% of processing expenditures (50% of utility) comes from development and processing of utilities' own engineering software.

- Despite utilities bringing remote computing and batch processing in-house, the market will continue to grow due to the inability of in-house departments to satisfy demand.

- Overall remote computing applications processing, in-house and RCS, is expanding at over 30% per year.

EXHIBIT V-10

## COMPUTER SERVICES MARKET FORECAST FOR UTILITIES, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 12 | $ 14 | 15% | $ 20 | $ 30 | 17% |
| SCIENTIFIC & ENGINEERING | 48 | 55 | 15 | 70 | 90 | 11 |
| INDUSTRY SPECIALTY | 32 | 40 | 25 | 65 | 130 | 27 |
| UTILITY | 73 | 81 | 11 | 105 | 130 | 10 |
| TOTAL PROCESSING | $ 165 | $ 190 | 15% | $ 260 | $ 380 | 15% |
| SOFTWARE PRODUCTS | 22 | 26 | 20 | 40 | 60 | 18 |
| PROFESSIONAL SERVICES | 55 | 59 | 9 | 70 | 90 | 9 |
| TOTAL | $ 242 | $ 275 | 14% | $ 370 | $ 530 | 14% |

($ MILLIONS)

- Applications protected from going in-house will expand at close to this rate in the industry specialty area.
- General business expenditures are from:
  - Small, rural electric coops. and small telephone companies.
  - Secondary applications processing, such as stockholder accounting, for large companies.
- Particular application opportunity is the matching of physical locations with demographic data for use in planning.
- Software products market is inhibited in the communications industry by Bell Labs. developing software packages and "giving" them to operating companies.
- Expenditures in very large installations are primarily for systems packages, particularly DBMS, such as IMS and related software.
- There is a turnkey system market for applications such as load leveling in major companies.
- Also, NRECA has approved certain vendors for supplying systems to small electric cooperatives.
- Because of inefficiency in development capability, utility companies often have to obtain systems development services outside.
- This is particularly true when regulatory or other government agencies indirectly or directly impose deadlines for new systems.

## 4. VENDOR ACTIVITIES

- GEIS is the leading vendor to the telephone companies with an estimated $12 million in revenues.

- GEIS' services include:

  - Utility processing where users run their own systems.

  - Utility processing where users run software (such as Central Office Business Information Systems) developed by GEIS with Bell Telephone Labs.

  - Industry specialty services where GEIS provides its own product, as in operator scheduling.

- GEIS also has an Electric Utilities Group and is a major supplier to electric power companies.

- Computer Consoles in Rochester, NY, is a turnkey systems house which has successfully concentrated on the telephone industry.

- CSC is an increasing force in the utilities industry:

  - Obtained a "Basic Ordering Agreement" contract with Western Electric probably worth $2 million per year.

  - Contracted with Electric Power Research Institute to analyze automation of electric power systems.

- CDC has a Utilities Service Center in Rockville, MD:

  - It serves both telecommunications and power companies.

  - Prime emphasis is power companies to which it is the leading supplier.
  - It provides data bases, nuclear code and engineering processing and power systems planning.

- Compu/Net (CDC subsidiary) offers radio station management services for traffic, sales, and billing.

- ARBITRON (another CDC subsidiary) is a $25 million per year TV and radio audience measurement research service:
  - Services accounted for $25 million in 1976.
  - Prime markets are networks and stations.
  - Information primarily published, but increasingly available, on-line.

- GTE Data Services serves independent telephone, CATV and other companies through 14 data centers.

- GTE buys RCS from GEIS and provides these services to its own end users.

- GEIS also supplies Continental Telephone.

- Rapidata had 30% of its 1976 revenues from New York Telephone:
  - One contract is for $7 million over 3 years.
  - Movement from Honeywell to DEC 10 equipment in 1977 will reduce revenues through performance increase.

- Remote Computing Corporation lost a major facilities management contract with Pacific Telephone and Telegraph (PT&T):

  - PT&T is going in-house on a CDC Cyber computer.

  - Conversion from Burroughs to CDC equipment will prove difficult.

  - Similar conversion of outside processing to CDC computer in Pennsylvania went well.

- Tymshare has several telephone company contracts, most notably with PT&T and New York Telephone (revenues are close to $2 million per year).

- Tymshare also does about $1 million annually for CATV billing.

- Computoservice, Inc. in Minn. is a service company participating in an automated meter reading project.

- MCAUTO appears to be making a concentrated effort in the utilities arena:

  - Major supplier of services to electric power utilities.

  - Has established a telecommunications industry program; quite successful in operator scheduling and other areas.

- National CSS is heavily dependent on telephone companies with major contracts with PT&T and New York Telephone, among others.

- United Telecommunications' subsidiary, UCS, is a major supplier to independent telephone companies.

- UCS with its CDC computers is one of the largest suppliers of processing services to the electric power industry.

- UCC provides engineering processing services to the power industry. With its new CDC capability it is competing strongly with established vendors.

- In broadcasting, Paperwork Systems, Inc. in Washington provides a billing, accounting, scheduling and traffic system.

- Kaman Sciences provides spot billing and commercial rotation for 40 TV stations. It also schedules advertising time and handles billing and receivables collection. Annual revenues from this source approximate $2 million.

- Data Communications Corp. of Memphis is the leading supplier of services to the industry:

  - Broadcast Industry Automation Service (BIAS) runs on dual Burroughs 6700s with local minis.

  - Control over commericals and immediate payoffs are strong selling points.

  - Also interfaces with engineering minis, which could lead to completely automated stations.

- National Data is working with WTCG on a direct sale system -- handles "call ins" in response to advertisements.

## F. BANKING AND FINANCE

### I. INDUSTRY CHARACTERISTICS

- As shown in Exhibit V-11, commercial banks account for over 50% of the employees in this sector.

- In the last 5 years, as shown in Exhibit V-12, commercial bank assets growth has been out-paced by savings and loan associations, and credit unions.

- With the exception of Texas, most large banking states allow limited or complete branch banking, as shown in Exhibit V-13.

- As shown in Exhibit V-14, 95% of banks have deposits of less than $100 million.

- Business to banks obtained from compensating balances is declining.

- Major change in the next several years will be bringing banking to the people. This change is fostered by competition and features the plastic card as the key to future development of the consumer area.

- Many savings and loans have strong relationships with commercial banks. Banks treat them as correspondents in some cases.

- Because of the nature of the industry there may be significant mergers among savings and loans in the next several years.

- Of the 13,000 federally chartered and 10,000 other credit unions, some have as much as $200 million in assets and 74,000 members:

    - Over 34 million Americans belong to credit unions.

    - Assets of $47 billion in 1976 were four times those of 1966.

## EXHIBIT V-11

## BANKING AND FINANCE INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | 109,000<br>1.9 MILLION |
| 60 | BANKS | NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | 37,000<br>1.2 MILLION |
| 601 | FEDERAL RESERVE BANKS | ASSETS (1975)<br>NUMBER OF BANKS (1975)<br>NUMBER OF EMPLOYEES (1974) | $120 BILLION<br>5,800<br>27,000 |
| 602 | COMMERCIAL BANKS | ASSETS (1975)<br>DEPOSITS (1975)<br>NUMBER OF BANKS (1975)<br>NUMBER OF BANKING OFFICES (1975)<br>NUMBER OF EMPLOYEES (1974) | $965 BILLION<br>$787 BILLION<br>14,600<br>44,400<br>1.1 MILLION |
| 603 | MUTUAL SAVINGS BANKS | ASSETS (1975)<br>DEPOSITS (1975)<br>NUMBER OF BANKS (1975)<br>NUMBER OF EMPLOYEES (1974) | $121 MILLION<br>$111 MILLION<br>480<br>43,000 |
| 61 | CREDIT AGENCIES (OTHER THAN BANKS) | NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | 52,000<br>445,000 |

## EXHIBIT V-11(CONT'D)

## BANKING AND FINANCE INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 612 | SAVINGS AND LOAN ASSOCIATIONS | ASSETS (1976)<br>NUMBER OF ASSOCIATIONS (1975) | $338 BILLION<br>5,000 |
| 614 | CREDIT UNIONS | ASSETS (1976)<br>NUMBER (FEDERALLY CHARTERED)<br>NUMBER (OTHER) | $ 47 BILLION<br>13,000<br>10,000 |
| 62 | SECURITY, COMMODITY BROKERS, AND SERVICES | NUMBER OF ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | 8,300<br>185,000 |
| 67 | HOLDING AND OTHER INVESTMENT COMPANIES | NUMBER OF ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | 10,800<br>116,000 |
| | | | |
| | | | |
| | | | |

## EXHIBIT V-12

## TOTAL ASSETS OF FINANCIAL INTERMEDIARIES,

## 1960 - 1975

| FINANCIAL INTERMEDIARY | 1960 ($B) | 1965 ($B) | 1960-1965 % GROWTH | 1970 ($B) | 1965-1970 % GROWTH | 1975 ($B) | 1970-1975 % GROWTH |
|---|---|---|---|---|---|---|---|
| COMMERCIAL BANKS | $257.6 | $377.3 | 46.5% | $ 576.2 | 52.7% | $ 958.4 | 66.3% |
| SAVINGS & LOAN ASSOCIATIONS | 71.5 | 129.6 | 81.3 | 176.2 | 36.0 | 338.4 | 92.1 |
| LIFE INSURANCE COMPANIES | 119.6 | 158.9 | 32.9 | 207.3 | 30.5 | 289.1 | 39.5 |
| MUTUAL SAVINGS BANKS | 40.6 | 58.2 | 43.3 | 79.0 | 35.7 | 121.0 | 53.2 |
| FINANCE COMPANIES | 26.9 | 44.8 | 66.5 | 62.5 | 39.5 | 92.5 | 48.0 |
| INVESTMENT COMPANIES | 17.0 | 35.2 | 107.0 | 47.6 | 35.2 | 42.2 | 11.3 |
| CREDIT UNIONS | 5.7 | 10.6 | 86.0 | 17.8 | 67.9 | 38.3 | 115.2 |
| PRIVATE PENSION FUNDS | 38.2 | 73.6 | 92.7 | 110.8 | 50.5 | 156.5 | 41.2 |
| STATE AND LOCAL PENSION FUNDS | 19.6 | 33.2 | 69.4 | 58.1 | 75.0 | 106.4 | 83.1 |
| TOTAL | $596.7 | $921.4 | 54.4% | $1,335.5 | 44.9% | $2,142.8 | 60.4% |

## EXHIBIT V-13

## BRANCH BANKING STATUS 1975

### ALL BANKS

| | |
|---|---|
| NUMBER OF BANKS | 14,630 |
| NUMBER OF BRANCHES | 30,000 |

### STATES WITH STATEWIDE BRANCH BANKING

ALASKA, ARIZONA, CALIFORNIA, CONNECTICUT, DELAWARE, HAWAII, IDAHO, MAINE, MARYLAND, NEVADA, NEW JERSEY, NORTH CAROLINA, OREGON, RHODE ISLAND, SOUTH CAROLINA, SOUTH DAKOTA, UTAH, VERMONT, VIRGINIA, WASHINGTON, AND D.C.

| | |
|---|---|
| NUMBER OF BANKS | 1,660 |
| NUMBER OF BRANCHES | 13,050 |

### STATES WITH LIMITED BRANCH BANKING

(LIMITED USUALLY TO COUNTY WHERE BANK'S HEAD OFFICE IS LOCATED OR TO CONTIGUOUS COUNTIES)

ALABAMA, GEORGIA, INDIANA, KENTUCKY, LOUISIANA, MASSACHUSETTS, MICHIGAN, MISSISSIPPI, NEW HAMPSHIRE, NEW MEXICO, NEW YORK, OHIO, PENNSYLVANIA, TENNESSEE, AND WISCONSIN

| | |
|---|---|
| NUMBER OF BANKS | 4,750 |
| NUMBER OF BRANCHES | 14,740 |

### STATES WITH UNIT BANKING

(BRANCH BANKING STRICTLY LIMITED OR PROHIBITED)

ARKANSAS, COLORADO, FLORIDA, ILLINOIS, IOWA, KANSAS, MINNESOTA, MISSOURI, MONTANA, NEBRASKA, NORTH DAKOTA, OKLAHOMA, TEXAS WEST VIRGINIA, AND WYOMING

| | |
|---|---|
| NUMBER OF BANKS | 8,210 |
| NUMBER OF BRANCHES | 2,190 |

## EXHIBIT V-14

## COMMERCIAL BANK DISTRIBUTION BY SIZE CATEGORY

| SIZE CATEGORY | DEPOSIT SIZE | NUMBER OF BANKS |
|---|---|---|
| VERY LARGE | > $ 1 BILLION | 70 |
| LARGE | $500 MILLION TO<br>$ 1 BILLION | 100 |
| MEDIUM | $100 MILLION TO<br>$500 MILLION | 620 |
| SMALL* | < $100 MILLION | 13,570 |
| TOTAL | | 14,360 |

*OF THE 'SMALL' BANKS, ALMOST 10,000 OF THEM HAVE UNDER $10 MILLION IN DEPOSITS; 2,500 FROM $10 MILLION TO $25 MILLION; AND 1,000 FROM $25 MILLION TO $100 MILLION.

  - Installment loans account for 20% of total asset volume.

- Advantage of credit unions is that they pay 6% on savings versus 5% on bank passbook savings, and charge 11% on personal loans versus 13.6% at commercial banks.

- U.S. Central Cooperative (like Federal Home Loan Bank Board for Savings and Loan) consists of 38 state, corporate centrals:

  - It will offer credit cards such as VISA.

  - It will also provide a secondary mortgage system like FNMA.

- Some credit union developments, such as share draft accounts, which are interest bearing checking accounts, have been blocked by banks.

## 2. USE OF EDP

### Commercial Bank EDP Characteristics and Issues

- EDP is generally considered vital to bank operations:

  - All banking executives consider EDP an important corporate factor.

  - Executives regard EDP as a definite factor in providing competitive advantages.

- EDP expense, as a proportion of banks' total expenses, has increased from an average of 5% in 1972 to 7% in 1975.

- Very large banks tend to spend an even higher percentage on EDP.

- Executive concerns are principally cost; specifically, the impact of electronic banking on EDP costs over the next several years.

- Other key issues to bank executives are data security, people availability and technology development.

Banking EDP Equipment and Network Development

- Banks currently spend $500 million per year on telecommunications, 1% of operating expenses. Because of regulation and also avoidance of duplication, networks will be shared in the future.

- On-line central information files (CIF) using CRTs are spreading even into small and medium banks through the activities of major equipment vendors:

    - Honeywell offers a system based on software from Affiliated Computer Systems, an ADP subsidiary.

    - Bunker Ramo has also worked with the same CIF product as a base for on-line systems such as Volts.

    - Burroughs also is supplying on-line systems to small banks.

    - Honeywell has a major Transaction Driven System (TDS) on its Honeywell 60 Series. The package was developed by Andresens Bank in Norway.

- Consumer indentification systems will make their appearance in the next few years, possibly using fingerprint, voiceprint or visual recognition. Computer control of this interface will be required.

- IBM is providing a signature recognition system for security purposes in banks.

- Voice response systems are achieving rapid penetration after relatively slow growth for a number of years.

- Although voice response has achieved recent success, it is in conflict with display systems. Cheap displays, such as that from Plantronics, are becoming strong competition.

- The telephone companies are making the Plantronic device available to their customers. Plantronic terminals have been installed at Seattle-First National Bank in this way.

- Time is critical in banking: Much emphasis is placed on time saved in waiting and processing. On-line teller terminals are the main factor in saving time.

Automated Teller Machines (ATMs) Still Controversial

- The controversy over what constitutes a branch continues. In March 1976, ATMs in retail outlets were ruled branches.

- Various forecasts for Automated Teller Machines (ATM) show 20,000 installations in the early 1980s.

- Bank of America, however, has said ATMs are currently too costly:

  - Costs $1.26 per transaction using ATMs.

  - Costs 35¢ per manual transaction using human tellers in the regular manner.

- As labor costs increase and equipment and processing costs decrease, a threshold crossover will occur.

- Other organizations, such as American Express, may push cash dispensers faster. AMEX now has 16 airport dispensers in place. Current use levels are low.

## Minicomputer Developments Continue Apace

- Citibank's decentralization to mincomputers is having problems:
  - Particular problems are those of software.
  - The concept espoused by Bob White of Citibank, namely increased productivity through functional processing, seems reasonable.
  - Unfortunately, implementation is a problem.
  - The trust service level provided by Citibank is reportedly the worst of any major New York bank, primarily due to the minicomputer decentralization process.
- Citibank has 2,400 correspondent banks around the country as users. It has already started to implement minicomputer-based correspondent bank systems, using IBM Series/1 as well as DEC computers.
- Bank of America is installing a major banking data network from Bunker Ramo. A hundred community branches will be included using minis in each branch and CRT systems.
- Another "distributed processing" network set up by Bank of America handles all switching of authorizations/transactions against 10 million checking accounts. However, the minis are located in only two centers.
- In commercial banks there will be strong penetration of turnkey systems and minicomputer base systems in decentralized bank departments such as foreign exchange trading, securities handling and funds management.

## Banking Software Development

- Banks, especially the large ones, tend to use the latest equipment and software:

  - Latest operating systems.

  - Almost all large banks use data base management systems, mostly IMS.

  - Customized network software.

- Of critical importance to vendors is the problem banks are having with software:

  - Over 70% of software costs are in maintenance.

  - New systems are large and more complex with on-line and security ramifications not hitherto encountered.

  - Consequently the development backlog is increasing.

- Over the next few years the types of systems implemented will become less transaction oriented and more information oriented. Particular systems required will be in the automation of credit and loan areas.

- Major changes in relationships between savings, demand deposit, and credit card accounts are expected in the next several years. These will have major impact on software requirements and processing in banks.

- POS/retail banking applications are of key importance now.

- General EFTS applications are more long-term considerations.

- Other current applications concerns are:

  - Revenue generating systems, such as for correspondent banking and customer services.

  - Commercial loan accounting and management.

  - New, consumer banking software.

- Among applications in banks of current key importance are float management and credit management.

- Credit management is a serious problem for banks:

  - As of October 28th, new regulations require all payments to be credited on day of receipt.

  - This increases the requirements for computers and services.

  - The requirements may be too great for existing systems.

- Complaint management is another system that is becoming more important.

Automated Bill Paying Systems

- A major change that will occur in the next 5 years is in bill paying procedures:

  - These may be handled through credit card processing systems or,

  - Through automated bill paying systems.

- Two-thirds of the consumer checks processed today are written to pay bills; thus, the impact of new systems on EDP requirements wil be considerable.

- In an automated bill paying system, the consumer calls in to a teller the transactions he or she wishes to make:

  - Seattle-First introduced a system in 1972 called "In Touch" which subsequently failed.

  - Prime reason for failures was the charge of $7.00 per month for the service, which was overly complicated.

  - Since that time at least 5 other banks have started programs which have been successful.

- In January 1977, St. Joe Bank in Indiana instituted a bill paying system combined with interest payment on checking accounts.

- For a bill paying system such as the SUPER CHECK system used by St. Joe, success depends on economic trade-offs:

  - For a bank, the cost of each check processed now is 15-17¢.

  - The cost of processing transactions on a bill paying system in volume is not yet known but could be less.

- To a consumer, there are definite economic advantages:

  - A telephone call to the bank costs 10¢ per call for unlimited time versus 13¢ for each check mailed.

  - Some consumers can get interest from money not being used in their checking accounts which they cannot get with regular checking.

  - With some systems the consumer can specify a release date for funds so that the money is kept working for him some extra amount of time.

  - With some systems the consumer will be able to get a money management report on his monthly checking statement.

- It appears that the consumer is willing to pay a flat 15¢ per transaction, or $2-3 per month, for this type of service which would give economic benefits to the bank.

- Its estimated that Pay-by-Telephone service in 1978 will be offered by 100 banks and savings and loans, with over 250,000 accounts serviced in this manner.

- Important factors for systems such as Pay-by-Telephone and Automated Teller Machines are critical mass and security.

- In this context, the error rate reported by Greater New York Savings Bank on a Pay-by-Telephone service is 1 in 9,000 versus 1 in 200 for checks.

- The Pay-by-Telephone service will be revolutionized by:

  - Voice input capability combined with,

  - Voiceprint recognition for security.

EDP In The Savings and Loan Industry

- The savings and loan industry is highly automated; 83% of all institutions are automated to some extent.

- Savings and loan expenditures for EDP are a much smaller percentage of total expenses and revenues than for commercial banks, amounting to about 1-1/4% of revenues in 1976.

- The savings and lending application areas within savings and loan account for 82% of all EDP expenditures.

- In the savings and loan industry, automation has provided for the handling of a million dollars of assets with 0.3 people per million in 1977 versus 1 per million in 1960.

- EFTS will become fundamental to the S&L industry within 3-5 years, faster than in commercial banking.

- The fastest growing EDP area in the savings and loan business is that of specialty consumer services.

- The savings and loan industry is almost totally dependent on on-line processing, with over 36,000 terminals in use in 1976.

EDP In Credit Unions, Brokerage, and Other Financial Industries

- Most data processing for credit unions is performed by computer services companies or by in-house data processing for company credit unions.

- In the brokerage industry, EDP is moving from simply supplying back office automation to supporting sales and marketing.

- Integrated data base activities are increasing rapidly; this involves putting internal data bases together with the major quotation services data bases.

- Applications for the support of commodity and option trading are required.

- The use of EDP represented by the number of terminals per office is increasing. For Quotron, this went from an average of 11.8 to 13.5 in 18 months.

- A key issue is the extent to which the computerized exchanges will be able to reduce costs and processing.

- In the consumer finance industry there are 25,000 offices with about 15,000 terminals installed to date.

- As well as increased penetration of remote computing into these offices, there is also considerable potential for upgrades of systems and terminals. Companies such as CIT, Household Finance, and Commercial Credit have put extensive on-line systems in place in the last several years.

- In the credit card industry, problems of counterfeiting and identification are significantly increasing EDP requirements.

- Debit cards, check guarantee cards and credit card duality will require major increases in EDP use; the spread of "plastic" through all financial institutions will continue.

- Some credit card consolidation in plastic and in processing will reduce number of potential buyers.

## 3. COMPUTER SERVICES MARKET FORECASTS

- This industry sector will continue as the largest computer services market, growing at 17% per year, as shown in Exhibit V-15.

- Industry specialty accounts for 87% of processing expenditures; major contributions (as shown in Exhibit V-16) are:

  - Commercial bank processing through FM or correspondent banking.

  - Securities related processing.

- In 1976, approximately 7,500 banks had their data processing done outside. At an average of $50,000 per year, this is a $400 million market: $120 million of this is classified by INPUT as banking FM to computer services vendors (2000 banks); $280 million for 5600 banks goes for correspondent bank data processing.

- In 1982, INPUT projects 9,000 banks spending an average of $100,000 per year for outside data processing services, even though many of them will also have small, on-site systems. This is a $900 million market which will be shared; $300 million for FM and $600 million for correspondent banks.

EXHIBIT V-15

## COMPUTER SERVICES MARKET FORECAST FOR BANKING AND FINANCE, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/ 76 % | 1979 | 1982 | AAGR 1977/ 82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 26 | $ 31 | 22% | $ 45 | $ 80 | 21% |
| SCIENTIFIC & ENGINEERING | - | - | - | - | - | - |
| INDUSTRY SPECIALTY | 805 | 925 | 15 | 1,250 | 2,000 | 17 |
| UTILITY | 94 | 114 | 21 | 155 | 220 | 16 |
| TOTAL PROCESSING | $ 925 | $1,070 | 16% | $1,450 | $ 2,300 | 17% |
| SOFTWARE PRODUCTS | 135 | 160 | 19 | 215 | 310 | 16 |
| PROFESSIONAL SERVICES | 85 | 100 | 18 | 140 | 230 | 18 |
| TOTAL | $1,145 | $1,330 | 16% | $1,805 | $ 2,840 | 17% |

($ MILLIONS)

EXHIBIT V-16

BANKING AND FINANCE INDUSTRY

SPECIALTY PROCESSING MARKETS, 1976-1982

| INDUSTRY SPECIALTY | USER EXPENDITURES | |
|---|---|---|
| | 1976 | 1982 |
| COMMERCIAL BANKING | | |
| - CORRESPONDENT BANKING | $280 | $ 600 |
| - BANKING FM | 120 | 320 |
| SECURITIES PROCESSING | | |
| - BANK TRUST DEPARTMENTS | 70 | 210 |
| - BROKERAGE | 45 | 90 |
| DATA BASES | 120 | 300 |
| SAVINGS AND LOAN | 115 | 250 |
| CREDIT UNION | 25 | 80 |
| OTHER SPECIALTY | 30 | 150 |
| TOTAL | $805 | $2,000 |

($ MILLION)

- In Savings and Loans (S&Ls), remote computing services are well entrenched and will grow rapidly with diversification of S&L activity.

- For bank trust departments, personal trust related expenditures for processing services will increase from 50% to 67% of the total.

- S&Ls and mutual savings banks will also be in the market for trust services.

- Competition in the correspondent banking and bank FM market will be vicious.

- Banks that got out of the business are re-entering the market; in some cases, by purchasing service companies.

- Automated trust services will also be increasingly provided by banks.

- "Private label" opportunities in correspondent banking and trust services will increase in a similar manner to payroll and accounting.

- General business services include small amounts of payroll and standard accounting for small organizations, and applications such as fixed asset accounting for large ones.

- More importantly, personnel and administrative applications will grow rapidly.

- Utility processing comes from:

    - Remote computing services for planning, modeling and marketing activities.

    - Batch utility services such as COM and data entry.

- Through use of sophisticated DBMS, utility RCS will continue to expand rapidly as vendors solve banking problems faster than in-house EDP departments.

- Applications software will increasingly be purchased by banks of all sizes, especially small and medium ones.

- Applications packages sales will drive the market for software products:

  - Turnkey systems in subsidiary activities such as funds management and leasing.

  - Demand from credit unions, S&Ls and smaller banks for software, which enables them to offer new services.

- Standard banking applications software market is largest in the $100 to $500 million size range:

  - Above that level banks try to do major applications themselves.

  - Below that, banks are candidates for data services or computer manufacturer systems.

- Growth in correspondent bank processing of various kinds will increase the market for multi-bank processing software.

- Continued change in banking activities and regulation will simply prevent in-house departments for doing much more than modifying existing systems.

- Complexity in the industry will cause professional services to expand rapidly for:

  - Minicomputer related software development.

  - Computer/communications systems.

  - Management information systems.

  - Cost analysis and control systems.

- For banks under $100 million:
  - 85% use computers.
  - 69% user services and 16% are in-house.
- Some movement of small banks to in-house hardware; cost is not the main reason, for example:
  - $15 million asset size bank previously paid $1,225 per month for paper, supplies and processing.
  - Bought NCR 399 to be depreciated over 7 years at $833 per month.
  - Operating cost will exceed service cost.
  - Reasons were control and convenience.
- However, need for new services to be competitive will keep most small banks using services.

## 4. VENDOR ACTIVITIES

- Automatic Data Processing has major business in the financial and banking industries:
  - Largest brokerage back-office processor with revenues over $20 million.
  - This should increase with the withdrawal from the market of the next largest vendor, the Midwest Stock Exchange.
  - Probably the second largest commercial vendor to savings and loan associations, with 170 clients, 2,000,000 accounts, and over $3.5 million in revenues.

  - Acquired Financial Computer Services which provides processing to 80 S&Ls and 50 banks.

  - Through ADP Network Services (Cyphernetics), provides financial data bases and a variety of RCS services to large banks.

- Affiliated Computer Systems (Dallas) was recently acquired by ADP from Mercantile Bank:

  - ACS has multi-bank processing software for banks in the $100-500 million size range.

  - Has a Honeywell-based, on-line CIF system using CRTs from Bunker Ramo.

  - ACS operates general correspondent bank processing centers in Texas and Oklahoma.

  - Software is also used by Computer Facilities, Inc.

- ARBAT consultants, headquartered in London, have achieved success with foreign exchange turnkey systems:

  - System is based on PDP11.

  - ARBAT also has SWIFT software.

- ARCOLA Software in Illinois is marketing SUPER CHECK, the Pay-by-Telephone service software used by St. Joe in Indiana.

- ACS and Florida Software are targeting on multi-bank, multi-branch software.

- AUTEX, now part of Itel, provides block trading information. Information is also being provided through Bunker Ramo's System 7.

- Bank of America processes 20,000 payrolls per month.
- Bank of America also has agreement with Rapidata for nationwide, computerized, deposit and balance reporting using voice response ("Rapidvoice").
- Boeing Computer Services provides S&L services in Philadelphia and Seattle:
    - Uses Financial Data Systems software.
    - Includes a 6 year contract with Jersey Data Network.
- Bunker Ramo's MDS 7/90 system will compete with Quotron's 800 system in the brokerage industry:
    - Will offer interface with in-house computers.
    - Place orders, switch messages, and provide customer information services.
- Bunker Ramo now services 2400 locations with 8,000 to 10,000 terminals covering 40% of securities brokers.
- Bunker Ramo has agreement with COMPATA to sell on-line transaction processing systems to banks.
- Bunker Ramo also offering a news service, the Dow Jones News/Recall.
- Canavert House, Ltd. provides portfolio performance relative to economic conditions: programs plus consulting sell from $13,000 to $20,000.
- Both Citibank and Bank of America will aggressively seek to acquire retail, oil company, and other financial institutions' credit card authorization and processing.

- Colorado Computer Corp. is a $2.5 million company with 50 bank customers for remote FM services.

- CompuServe is an RCS vendor with an on-line portfolio management system.

- Computer Dimensions (Itel) processes for credit unions with 700,000 subscribers through Users, Inc.

- Computer Facilities, Inc. (Itel) uses ACS software to provide processing services, including on-line CIF to 8 banks in New England.

- Computer Sciences Corporation has two major FM contracts:

  - Zion National Bank in Utah.

  - Mason-McDuffie Company, the 12th largest mortgage bank.

- Computer Usage Corporation has worked with Qantel equipment and installed 130 turnkey systems in banks for funds transfer/money management.

- Computeristics, a UniRoyal subsidiary, offers National Check transmission:

  - Computer/communications service.

  - Regional lock-box consolidation.

- It also provides employees benefits services to banks.

- Comshare has an agreement with National Data to provide the network for cash management services.

- In correspondent banking:

  - Citibank has 2,400 correspondent banks.

  - Decimus (Bank of America) and First National Bank in Chicago are leading correspondent banking vendors.

  - First National re-entered the market and acquired Beverly Bancorp, renamed First Chicago Data Corp.

  - Wachovia Services, Inc. has 20 bank clients, it provides CIF system via NCR 399 to Century Computer; has 17 remote centers.

  - Mellon Bank in Pittsburgh services 172 banks; some as far away as Indiana.

- Dial Computer Systems (subsidiary of Dial Financial) processes for 12 consumer finance companies.

- Eastern Airlines has a multi-million dollar contract with CIT Financial Corporation for CITation:

  - On-line system connecting 800 branch offices.

  - Development effort took 100 programmer/analysts.

- EDS targets large and very large banks for FM. It has 5 clients:

  - EDS is a major processor for credit unions.

  - EDS services 30 S&Ls through FM relationships.

- ERCO in Dayton, Ohio is an example of a small, specialized processing services company with 70 credit unions as clients.

- TRW now offers terminals to banks through its Financial System Division (FDS/i); it may well offer processing services in the near future.

- Financial Computer Systems was acquired by ADP:
  - Burroughs-based.
  - $3 million per year.
  - 54 banks and 14 S&Ls as clients.
- Financial Industry Systems is a joint venture of Hartford National Bank and Trust Company and Martin Marietta Corporation:
  - Provides processing services to financial institutions in New England.
  - Sells software packages (PIPS) to ACHs and their customers for automatic funds transfer.
- Financial Technology, Inc. in Chicago is developing a bank information system. Its GL/FIS package is installed in over 200 banks.
- Florida Software is one of the most successful vendors of banking software:
  - 800 banks use one or more software products.
  - Concentrates on banks in the $200 million to $500 million range.
  - Software is used by ACTS and Metridata for bank processing.
  - 170 people and $4.5 million annually.
- GTE Information Services provides Q-Quote to the securities industry; it has not expanded services like Quotron and Bunker Ramo.
- General Electric Information Systems provides cash management services to Chemical Bank.

- GEIS also provides financial planning services to S&Ls through a joint venture with McSweeny and Associates.

- Informatics acquired Direct Dial Data Systems for banking customer services.

- Interactive Data Corporation ($16 million per year Chase subsidiary) concentrates on financial industry:

  - XPORT is its successful portfolio management system for data analysis and modeling.

  - Also provides financial data bases.

  - Bought Dynamics Associates, Inc. which developed XSIM, its proprietary DBMS.

- IDC actually works with BTSI (a CDC subsidiary) to serve 75 brokers and 3 New York banks with pricing and dividend announcements.

- Inter Continental is a $4.5 million company providing on-line and batch services to credit unions.

- Itel is growing fast in this industry sector:

  - AUTEX is a subsidiary.

  - Acquired Bankputer Corp. in Connecticut.

  - Will integrate it with Computer Facilities, Inc., a previous acquisition in the same area.

- Kaman Sciences provides $1 million of standard bank processing in batch mode.

- MACS is a small ($2 million per year) company servicing S&Ls and credit unions: Its recent merger with Anacomp fell through.

- Management Science America (MSA) has a fairly old, but comprehensive, set of banking software that is rapidly being upgraded:

  - 30% of $12 million 1976 revenues from bank packages.

  - Spent $2 million last year on development.

- Metridata Computing, Inc. is successfuly building its banking business in Kentucky, Ohio, and Chicago, Illinois:

  - Revenues of $10 million in 1975; 50% from banks.

  - Uses its own and Florida Software software.

  - Constructing a rudimentary network for bank services.

- NCR Corp. is the largest commercial vendor servicing S&Ls:

  - 1976 revenues of $17 million (43% of all commercial vendor business).

  - Processes 10 million accounts at 500 S&Ls through 9 regional data centers.

- As well as cash management services, National Data provides banks with credit card authorization services.

- It has $6 million contract with SE Banking Corp. for this.

- National Sharedata provides FM services to banks through 38 regional centers:

  - Targets are $200 million banks.

  - Most of 450 clients are in $50-150 million size range.
  - Recently acquired FM contract with Security Bank and Trust of Southgate, Michigan (largest client at $500 million).
  - Contract worth $15 million for 5 years.
  - Moving to SOLIS (Sharedata On-Line Information Services) presently installed at United Financial Services, Illinois.
  - Sales of $27.1 million in 1976, up 25% over 1975.
  - Significantly, it is getting renewals for periods of 5 and 6 years.
  - It services S&Ls with a total of 220,000 accounts.
  - Through its bank centers, it provides services to 1,000 commercial accounts.

- On-Line Systems has a 5-year FM contract with Dynabank in Atlanta.

- Quotron Systems, Inc. has 37% of $70 million financial information business with $25 million revenues in 1976:

  - Merrill Lynch accounts for 18% of revenues.
  - Quotron 800 system was first to give stock quotes and provide interactive capability for orders, etc.
  - Moving out into bank trust departments and insurance companies:

- Rapidata provides Bank of America with BAMTRACK, using voice response:

  - Also has exclusive contract with State St. Bank, Boston to provide TITAN for foreign exchange accounting and control.

  - Specializes in the financial industry, providing portfolio analysis and management tools as well as several financial data bases.

- Remote Computing Corporation is expanding its services to the financial industry:

  - Leading vendor of financial planning services to S&Ls.

  - Through AMMINET, it provides a quotation data base of secondary mortgage market loans.

- SEI has been very successful in providing personal trust services:

  - Wells Fargo is its largest client.

  - Service is based on multiple minicomputers installed at a central processing site.

- SBC was an early processor of brokerage accounts:

  - This has been de-emphasized.

  - Now primarily provides data bases and portfolio evaluation to financial clients.

  - FOCUS is the major on-line system for credit unions accounting for over $5 million in revenues.

- Systematics, Inc. is one of the strongest, independent banking FM suppliers:

  - Revenues in 1976 were probably over $12 million.

  - Growth rate 40-50% per year.

  - Over 70 customers, asset sizes $145 million to $2 billion.

  - 5 centers in Michigan where it recently acquired SysCon, Inc.

- Systems Development Corporation bought Moll Associates, a Burroughs-based $2 million bank processor in the North East:

  - Contract with Savings Association Central Corp. (82 S&Ls) to develop EFTS in California for $1.2 million.

  - $1.25 million contract with Knickerbocker Federal S&L.

  - Offers Auto-Bond, a bond coupon processing system from Manufacturers Hanover.

- Telephone Computing Systems is another "Pay-by-Telephone" software vendor.

- Telstat Systems (Western Union) offers variety of computerized securities information including TAXPRICE.

- Tymshare offers a variety of financial and banking services:

  - TYMQUOTE under license from D.H. Data Associates (computerized data bank of over 23,000 securities).

  - Acquiring WSBA (Western States Bankcard Association) credit card processing operations.

  - Processes Master Charge/VISA for 270 member banks; 6,000,000 card holders; 200,000 merchant outlets.

  - Also sells banking software targeting banks with $35 to $350 million assets.

- UCC is the leading supplier of software to large banks (over $500 million):
  - $7 million of software sales.
  - 180 accounts.
  - FCS installed at over 160 clients.
  - Will provide packages based on IMS and DL/1.
  - Dropping unprofitable FM contracts.
  - Also provides thrift software.
- Weiland Computer Group, Inc. operates two cooperative banking centers:
  - Now emphasizing software sales rather than processing.
  - SBC is selling services based on Weiland Software in Los Angeles.
  - Also BSI (OSI's subsidiary) in Dallas uses their software.
  - Poor-Man-Douglas in Oregon is another processing company user.
- In the savings and loan industry, the Federal Home Loan Banks are the largest vendor:
  - ADAPSO has forced a ruling, now under appeal, requiring FHLBs to divest themselves of these operations.
  - NCR and ADP are the two largest commercial vendors.

## G. INSURANCE

### 1. INDUSTRY CHARACTERISTICS

- As shown in Exhibit V-17, only 20% of the approximately $150 billion of receipts in the insurance industry comes from life insurance premiums.

- With receipts of $75,000 per person, the industry has achieved relatively efficient use of staff.

- It is still labor intensive and companies are continuously seeking ways to increase productivity.

- The problems inherent in the health industry are reflected by the fact that public funding of personal health care in 1975 was 42% of the total ($50 billion) while private health insurance premiums were $21 billion.

- From 1975 to 1976, health care expenditures in the U.S. increased from $120 billion to $140 billion.

- Private health insurance is lagging behind and National Health Insurance may well eventually replace it almost entirely.

- For this reason, major health insurance companies, such as Equitable and Connecticut General, participate in Medicaid/Medicare programs in order to protect their future interests under NHI.

- In 1976, there were approximately 1,800 life insurance companies and 3,000 property and casualty companies.

- Total assets of life insurance companies are over $300 billion with the top 50 companies accounting for $250 billion.

EXHIBIT V-17

INSURANCE INDUSTRY SECTOR-

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 63 | INSURANCE (LIFE, HEALTH, PROPERTY, CASUALTY) | NUMBER OF EMPLOYEES (1976) | 1.7 MILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 24,000 |
| | | PROPERTY AND LIABILITY, PREMIUMS WRITTEN (1976) | $ 60 BILLION |
| | | LIFE INSURANCE, PREMIUM RECEIPTS (1976) | $ 31 BILLION |
| | | ANNUITY INSURANCE, PREMIUM RECEIPTS (1976) | $ 14 BILLION |
| | | HEALTH INSURANCE, PREMIUM RECEIPTS (1976)* | $ 21 BILLION |
| | | INVESTMENT INCOME (1976) | $ 19 BILLION |
| | | TOTAL INCOME LIFE INSURANCE COMPANIES | $ 85 BILLION |
| 64 | INSURANCE AGENTS, BROKERS, AND SERVICE | NUMBER OF EMPLOYEES (1974) | 346,000 |
| | | NUMBER OF ESTABLISHMENTS (1974) | 66,000 |
| | | | |
| | | | |

*Excludes Blue Cross/Blue Shield and other plans independent of insurance companies

- All types of insurance companies prospered in 1976.

- Variable life policies have been approved by SEC and this should finally start this market moving.

- Insurance companies are becoming increasingly competitive with banks and other financial institutions:

    - Pension fund management and accounting is a major target for them.

    - They are entering the personal trust business.

## 2. USE OF EDP

- Because of labor replacement impacts, automation (represented by use of EDP) is an important corporate consideration to insurance company top management.

- Exposure to EDP by executives in this sector is likely to be second only to banking and finance executives.

- EDP budgets are tracking growth in company revenues fairly closely: 1976/77 growth of 10% or more are common.

- EDP is highly centralized in insurance companies:

    - Many EDP managers also control entire communications budget.

    - Majority of large EDP installations are responsible for office computer procurements.

- Hierarchical network development is proceeding apace:

  - Terminals and data communications expenditures up by 100% this year in some cases.

  - Data entry expenditures decreasing.

  - Most pressing objective is to increase remote computing capabilities.

- Applications requirements are primarily for on-line claim servicing and administration, financial reporting, corporate pension systems, underwriting services, and marketing systems.

- Major insurance applications are costly and lengthy to implement; conversion is a major problem:

  - Hartford Insurance went to ALIS from IBM.

  - Took 3 years to plan and install, with $2 million for conversion.

  - Commercial insurance was to take $4 million and 41 months to install, but they decided it was too long.

- Data entry is a significant problem because of multitudinous firms:

  - IBM has a digitizing system under test which enters data without encoding.

  - Reduces number of steps in handling a document significantly.

  - Cost and availability of equipment will push centralization again.

- On-line systems, however, are main solution to data entry problems:

  - Aetna Life and Casualty will cut 50% off time for processing applications for life policies.

  - Will use on-line system based on Insurance System of America software.

- Life and health companies have been slower to move on-line than property and casualty:

  - John Hancock Mutual Life Insurance Company now has on-line claims approval.

  - Equitable has gone to distributed minis for claims paying; key factor in decision was development time.

- Although some companies are going to on-line CRTs for claims processing, Pennsylvania Blue Shield found on-line costs too high: they are going to Entrex off-line data entry.

- The independent insurance broker/agent has been mainly served by local batch services:

  - 66,000 independent agency establishments accounting for over $4 billion of premium receipts.

  - 15,000 to 20,000 agencies currently using or capable of using EDP services or equipment.

  - Agencies are not concentrated; the largest have less than 100 offices.

- No leading computer service vendor has established a major position in this market:

  - There are several regional service bureaus with 10-20% market share.

  - Services offered are primarily batch at the level of $250-300 per month.

  - Automatic Data Processing and Service Bureau Company have started to penetrate the market.

- Service bureaus and others are increasingly offering turnkey systems for on-site processing at independent agencies:

  - Costs will be too high for many of them.

  - Problems of maintaining systems in a rapidly changing environment have not been addressed by vendors.

- Opportunity exists for insurance company/agent computer/communications system:

  - Insurance companies will "push-out" their own systems like United Airlines did in travel agencies.

  - Agents, however, will not want to have six different systems from six insurance companies.

- The insurance industry is one where privacy regulation will have a major effect on the scope of EDP requirements.

- This industry is also where the interface between data and word processing is the closest:

  - Reflected by the involvement of EDP managers with office computers.

  - Letter writing, correspondence management, mailing management, and complaint handling are all "information" applications that will expand rapidly.

### 3. COMPUTER SERVICES MARKET FORECASTS

- Over 75% of processing services revenues are industry specialized, as shown in Exhibit V-18.

EXHIBIT V-18

## COMPUTER SERVICES MARKET FORECAST FOR INSURANCE, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AACR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 15 | $ 18 | 20% | $ 25 | $ 42 | 19% |
| SCIENTIFIC & ENGINEERING | - | - | - | - | - | - |
| INDUSTRY SPECIALTY | 253 | 290 | 15 | 385 | 553 | 14 |
| UTILITY | 37 | 42 | 14 | 55 | 80 | 14 |
| TOTAL PROCESSING | $ 305 | $ 350 | 15% | $ 465 | $ 675 | 14% |
| SOFTWARE PRODUCTS | 52 | 62 | 19 | 95 | 150 | 19 |
| PROFESSIONAL SERVICES | 60 | 68 | 13 | 95 | 145 | 16 |
| TOTAL | $ 417 | $ 480 | 15% | $ 655 | $ 970 | 15% |

($ MILLIONS)

- Facilities management and other processing services expenditures for government funded health insurance (Medicaid/Medicare/CHAMPUS) account for $135 million, over 50% of the 1976 industry specialty market.

- This represents 30% of total EDP expenditures for Medicaid, Medicare, and CHAMPUS, shown in Exhibit V-19, excluding direct federal government expenditures.

- By 1982, the same share of total EDP expenditures, without major increase in federal involvement, could be over $500 million if sweeping National Health Insurance (NHI) is introduced.

- INPUT projects that NHI will evolve, that the federal government will increase its share of processing, and that consequently, the processing services market will "only" reach $300 million by 1982.

- In addition, the professional services market will expand rapidly as systems for Medicaid and Medicare require changing or replacement.

- Also, quality control systems such as that tested by Control Analysis Corporation in Oregon will expand rapidly.

- Accounting companies such as Touche Ross and Peat Marwick will take the major share of this business together with local consulting companies and IBM.

- Insurance companies will also require considerable outside assistance in systems development as they expand their remote processing applications and move into new applications.

- In independent agency processing:

    - Some batch business will be converted away to new turnkey systems.

EXHIBIT V-19

## NATIONAL HEALTH INSURANCE IMPACT ON EDP EXPENDITURE FORECASTS FOR FEDERALLY FUNDED HEALTH INSURANCE

| ITEM | | 1976 | NHI SCENARIO I 1980 (1) | NHI SCENARIO II 1980 (2) |
|---|---|---|---|---|
| 1a. | MEDICARE CONTRACTORS | | | |
| | PART A | $ 28 | $ 50 | $ 15 |
| | PART B | 78 | 130 | 35 |
| | SUB-TOTAL | 106 | 180 | 50 |
| 1b. | MEDICARE SUB-CONTRACTORS | 34 | 75 | 10 |
| | TOTAL MEDICARE | 140 | 255 | 60 |
| 2. | CHAMPUS | 8 | 12 | 12 |
| 3a. | STATE AND LOCAL GOVERNMENT IN-HOUSE EXPENDITURES - MEDICAID | 100 | 125 | 15 |
| | MEDICAID CONTRACTORS AND SUB-CONTRACTORS | 144 | 175 | 25 |
| | TOTAL MEDICAID | 244 | 300 | 40 |
| 4. | NATIONAL HEALTH INSURANCE | 0 | 50 | $ 1,000 |
| 5. | OTHER | 20 | 50 | 100 |
| | TOTAL EDP | $412 M | $667 M | $1,212 M |

($ MILLION)

  - Remote Computing Services will replace batch business as terminal costs reduce.

  - Insurance companies themselves will impact the independent agency business by reducing its relative size as well as offering services.

  - Current batch business to independent agencies is over $30 million per year.

- General business applications in the personnel area will be an opportunity, primarily for RCS.

  - Portfolio management and analytical RCS will expand rapidly as insurance companies increase variable life policies and manage their security assets more closely.

- Insurance companies will increase their use of forecasting and econometric data base services.

- In the utility processing market, COM and data entry services will continue to grow in smaller insurance companies.

- There are RCS opportunities in general business and industry specialty processing for actuarial analysis, corporate and market planning, and investment analysis.

- The software products market will expand more rapidly than projected last year:

  - Standard products will continue to expand as projected; insurance applications are among the more expensive applications packages.

  - New applications for financial activities in trust and other departments will emerge.

  - Packages to support marketing and sales activities, such as letter writing, will grow very rapidly.

  - Turnkey systems for agents and offices of insurance companies will increase rapidly from a low base.

- In summary, the insurance industry is a major opportunity area for computer services vendors of all kinds.

## 4. VENDOR ACTIVITIES

- ADP Network Services serves independent insurance agents with an RCS-based marketing rating and policy management system.

- Agency Record Control, one of the largest suppliers of services to independent insurance agents/brokers, has over 3,000 users.

- Bergen Brunswick removed itself from supplying computer services to the health insurance industry by dissolving Health Applications Systems (HAS).

- Bradford National has entered the Medicaid processing market in a big way by winning the New York State contract:

  - Contract is for design, development, and implementation of state-wide system.

  - This is a consolidation of the program from the operations of 58 previous Medicaid units in New York State.

  - Contract is for $32 million in the first year and $95 million over 3 years.

  - Entire system is due to be implemented in November 1978.

  - Bradford has subcontracted with The Computer Company (Richmond, VA) for Medicaid expertise since it had none itself.

  - State will operate three subsystems while Bradford will operate the claims processing, utilization review, and management reporting subsystems.

  - Nature of this contract means it is unlikely to go smoothly.

- Computer Dimensions (Itel) serves the casualty insurance industry: processes insurance applications against driving records for over 70 clients.

- Computer Sciences Corporation has one of the few non-Medicaid/Medicare FM contracts with a $12.5 million, 5 year contract with American Reserve Corporation.

- Dataflow in Atlanta provides RCS to casualty companies based on Department of Motor Vehicle records.

- Deltanet processing was acquired from HAS by Brandon & Tesseract: processes dental claims in six states.

- Electronic Data Systems (EDS) is by far the largest computer services vendor for government funded health insurance:

  - 60% of FY 1976 revenues ($70 million) from Medicaid/Medicare/CHAMPUS.

  - California contracts total $20 million/year.

  - Has become an insurance company as well.

  - Now bids "at risk" contracts.

  - Also bids for full fiscal agent/intermediary contracts against Blue Cross/Blue Shield and insurance companies such as Equitable and Connecticut General.

  - Much more agressive in last year than in recent years, sparked by management changes.

  - However, lost bids in New York and Massachusetts.

- EDS also has $10 million in services and software revenues from life and casualty insurance companies.

- Grumman's $60 million per year EDP system and services subsidiary acquired MMI Corp. (name changed to ISI Systems, Inc.) in 1976. ISI specializes in data services for insurance companies.

- Informatics (subsidiary of Equitable Life Assurance) specializes in insurance:

  - As a sub-contractor to Equitable, it processes, or will shortly process, Medicare Part B in 4 states.

  - Through Equimatics, provides LIFE-COM software; joint development of 30 insurance companies.

- INSCO (The Continental Corporation) provides utility services and some specialized services to other insurance companies.

- INA is another insurance company which offers services to other insurance companies, particularly automobile insurance processing.

- Insurance Systems of America provides, among other products, a letter writing system used by Travelers and Mutual Life Insurance Company of New York.

- Optimum Systems, Inc. offers Medicaid/Medicare processing systems:
    - Its only major processing contract is with Connecticut General for the State of Connecticut Medicare and Medicaid.
    - Replaced MCAUTO in the Medicare contract worth over $1 million per year.
    - Otherwise most of its $3 million revenues come from systems design and programming contracts.
- PRC Information Systems (PRC) has recently entered the government funded health insurance industry with some success:
    - CHAMPUS processing for Indiana and Kentucky.
    - Developing Medicaid system.
- Service Bureau Company (CDC) offers processing services based on Life/70 from TCC:
    - Aimed at companies with less than 50,000 policies.
    - Also has sales illustration services for life insurance using Multiple Funding Corporation of America software.
- Other vendors in government funded health insurance are:
    - Consultec: Medicaid/Medicare systems development and consulting.
    - Cybernetics and Systems, Inc. (Seabord Coast Line): joint venture for State of Kentucky for MMIS development.
    - Data, Inc.: EDP sub-contractor to South Dakota Blue Shield for Medicare.

  - Delphi: New Hampshire Medicaid development.

  - Dikewood Industries: Medicaid fiscal agent in Montana. (New Mexico lost to EDS.)

  - FMS Management Services: MMIS development contracts for West Virginia and Maryland; accused of using HEW official while employed there to get contracts.

  - MCAUTO: model system being used for Medicare in several states.

  - Management Data Communications Corp. (MDCC): FM in Illinois, Wisconsin, and North Dakota for limited Medicaid acitivites.

  - System Resources, Inc. (CDC): Medicare Part B FM in Utah and Kansas; has installed 8 other systems; problems with its FM contracts.

  - The Computer Company: Fiscal agent for Virginia; also performing development work for Maryland and Arizona; sub-contractor to Bradford National for New York.

  - Turnkey Systems, Inc.: development on Medicaid in Kentucky and New Hampshire.

- Tymshare has a small Medicaid processing contract; it also offers a computerized rating system from an insurance agency, MAARS, Inc.

- Other major vendors to independent insurance agents/brokers are:

  - ETC (NY): 360 batch processing.

  - Interstate Business Services (Ohio): Honeywell batch/remote processing.

- Matrix Insurance Services (Texas): 360 batch processing.

- Safecom (subsidiary of Safeco Insurance, Washington): batch and remote processing on 370/168.

- Systams Corp. (Florida): large suppler with multiple 370s.

## H. MEDICAL

### I. INDUSTRY CHARACTERISTICS

- Health is the third largest industry in the U.S. accounting for 9% of the gross national product and employing 5% of the labor force.

- Total health care expenditures in 1976 were over $140 billion, as shown in Exhibit V-20, having grown 31% in two years.

- Estimated health care expenditures for 1977 are over $160 billion, as shown in Exhibit V-21. They may be as high as $175 billion.

- Medical industry sector coverage excludes items such as drugs and appliances. Personal health services covered by this sector accounted for over $100 million in 1976.

- There is increasing overlap between the health insurance industry (covered in insurance industry sector) and the medical industry:

  - Government funded health insurance programs such as Medicaid and Medicare impinge on the administrative and review functions.

  - Health maintenance organizations (HMOs) combine insurance and medical functions.

- INPUT includes HMOs and Prepaid Health Plans (PHPs) in the medical industry sector.

- There are 180 HMO/PHPs in the U.S.:

  - Only 30 are federally certified now.

EXHIBIT V-20

MEDICAL INDUSTRY SECTOR-

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 80 | MEDICAL | HEALTH EXPENDITURES (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1975) | $142 BILLION<br>247,000<br>4.2 MILLION |
| 801 | PHYSICIANS | HEALTH EXPENDITURES (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 27 BILLION<br>118,000<br>516,000 |
| 802 | DENTISTS | HEALTH EXPENDITURES (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 8.6 BILLION<br>71,400<br>220,000 |
| 803 | OSTEOPATHS | NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | 4,000<br>14,000 |
| 804 | HEALTH PRACTITIONERS N.E.C. | HEALTH EXPENDITURES (1976)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 2.3 BILLION<br>19,000<br>46,000 |
| 805 | NURSING HOMES | HEALTH EXPENDITURES (1976)<br>NUMBER OF HOMES (1973-74)<br>NUMBER OF EMPLOYEES (1973-74) | $ 9.8 BILLION<br>16,000<br>713,000 |

## EXHIBIT V-20(CONT'D)

## MEDICAL INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 806 | HOSPITALS | HEALTH EXPENDITURES (1976)<br>NUMBER OF HOSPITALS (1974)<br>NUMBER OF EMPLOYEES (1974) | $ 57.4 BILLION<br>7,000<br>2.7 MILLION |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## EXHIBIT V-21

## HEALTH AND MEDICAL SERVICES: TRENDS AND PROJECTIONS, 1970 - 1977

| | 1970 | 1975 | 1976 | PERCENT CHANGE 1975-76 | 1977 | PERCENT CHANGE 1976-77 |
|---|---|---|---|---|---|---|
| HOSPITAL CARE | $ 27.4 | $ 50.2 | $ 57.4 | 15% | $ 65.6 | 14% |
| PHYSICIANS' SERVICES | 14.3 | 23.3 | 26.5 | 14 | 30.0 | 13 |
| DENTISTS' SERVICES | 4.8 | 7.8 | 8.6 | 10 | 9.4 | 9 |
| OTHER PROF. SERVICES | 1.5 | 2.2 | 2.3 | 6 | 2.4 | 7 |
| DRUGS & DRUG SUNDRIES[1] | 7.4 | 11.2 | 12.3 | 10 | 13.5 | 10 |
| EYEGLASSES & APPLIANCE | 1.8 | 2.5 | 2.7 | 9 | 3.0 | 9 |
| NURSING HOME CARE | 4.3 | 9.8 | 11.4 | 17 | 13.2 | 16 |
| EXPENSES FOR PREPAYMENT & ADMINISTRA. | 2.1 | 4.7 | 4.9 | 3 | 5.0 | 3 |
| GOVERNMENT PUBLIC HEALTH ACTIVITIES | 1.6 | 3.8 | 4.8 | 25 | 6.1 | 27 |
| OTHER HEALTH SERVICES | 2.6 | 3.2 | 3.6 | 12 | 4.0 | 12 |
| SUBTOTAL | $67.8 | $118.7 | $134.5 | 13% | $152.2 | 13% |
| RESEARCH | 1.8 | 3.0 | 3.3 | 11 | 3.7 | 11 |
| CONSTRUCTION | 3.4 | 4.6 | 4.7 | 3 | 4.8 | 2 |
| SUBTOTAL | $ 5.2 | $ 7.5 | $ 8.0 | 6% | $ 8.5 | 6% |
| TOTAL | $ 73.0 | $126.2 | $142.5 | 13% | $160.7 | 13% |

($ BILLIONS)

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[1] Research expenditures of drug companies included in drugs and drug sundries and excluded from research expenditures.

Source: Office of Research Statistics, Social Security Administration, Bureau of Labor Statistics, and BDC.

  - Under 7,000,000 subscribers.

  - Also 200 foundations for medical care which operate on a fee-for-service basis.

- However, qualifications will change so that federal certifications of HMOs will become easier.

- By law, employers with over 25 people must offer it as an option in future.

- Fastest growing HMOs are those with company sponsors.

- Kaiser Permanente has 3,000,000 subscribers and has just been federally certified.

- 1,000 HMOs are projected by 1980 with well over 10,000,000 subscribers.

- In the hospital area, hospital management is expanding rapidly:

  - More than one-third of hospitals have some kind of management agreement.

  - Federal and local government agencies, universities, religious orders, charities, and foundations all operate hospitals.

  - There is also a considerable amount of "sharing," such as the Detroit Medical Center which operates 5 hospitals.

- Private hospital "chains" own 300-400 hospitals and manage 200 more:

  - American Medical Corp.: 12,000 employees; develops and manages.

  - Hospital Affiliates: owns under 30; manages 50.

  - Hospital Corp. of America: owns nearly 70; manages 10-20.

  - Humana: owns nearly 70; manages none.

- Hospitals, particularly university hospitals, often initiate HMOs; two examples are Massachusetts General Hospital and Harvard Community Health Plan.

- Of the 16,000 U.S. nursing homes, California has 1,600 and Ohio 1,100.

- There are 16,000 clinical laboratories in the U.S.

  - 60% in hospitals and outpatient clinics.

  - 35% owned privately or by group practices.

  - Remainder in government facilities other than hospitals or outpatient clinics.

- There are 15,000 dental laboratories in the U.S.

- The medical profession is consolidating, just as bakers, butchers, lawyers, and accountants have done or are doing:

  - 24% of practicing, non-federal physicians, excluding interns and residents, are now in group practice.

  - Increase of 67% since 1969.

  - Number of groups has increased in the same period by 33%.

- Thus, the number of groups is increasing while the groups themselves are increasing in size more rapidly.

## 2. USE OF EDP

- Driven by government and public demand for better services and controlled costs, EDP use will increase rapidly in this sector.

- Administrative and recordkeeping applications are generally accepted. First and second generation software and processing will be upgraded to meet new demands.

- Clinical and medical use of EDP is not accepted by "professionals," doctors and others. This will change slowly but will expand EDP opportunities by an order of magnitude.

- In major cities, 50-75% of physicians use EDP; in rural areas hardly any do so.

- The over 7,000 hospitals account for 3% of data processing sites in the U.S. and 2.5% of general purpose computers according to Computer Intelligence files.

- Of these hospitals:

    - 10% do not use any type of data processing.

    - 10% use both an in-house computer and outside services.

    - 38% use in-house computers only.

    - 42% use outside services only.

- There is migration between the two modes of EDP with in-house computers replacing services in some cases and vice versa.

- More than 1,000 hospitals have some or all of their EDP work performed for them through other hospitals:
  - Hospital chains.
  - Religious orders serve about 6% of hospitals with EDP.
  - "Sharing" by geographically close hospitals.
- EDP processing costs are increasing rapidly in hospitals:
  - In 1976, 20% of hospitals were paying over $3 per patient day (30% for hospitals with over 500 beds), compared to 1% in 1970.
  - Over 50% of hospitals in 1970 paid less than $1 per patient day for EDP; in 1976 about 25% were in this category, including almost all small hospitals and only 10% of hospitals with over 300 beds.
- Federal government is promoting central medical services to remote areas:
  - Lockheed is working with NASA and HEW.
  - Remote clinics and mobile centers will be linked through satellite communications.
  - Data base established on a central IBM 370/155.
- Patient monitoring in hospitals is expensive:
  - Few stations yet.
  - Some in intensive care units.
  - Cost of bedside terminal can be $30,000-35,000.

  - Necessary to interface with data bases.

  - Requires network of minicomputers in a hospital.

- Work is funded by federal government:

  - IBM equipment used for large systems.

  - DEC equipment used for small systems.

- Universities heavily involved in clinical developments:

  - Massachusetts General Hospital has led in use of EDP for 20 years; developed MUMPS language for quick access to clinical records.

  - Duke University operates a cardiology data bank, regional network of cardiology data banks with regional characteristics.

  - Stanford University has over 20 data banks, including one for genetic disorders.

- IBM has project with Lockheed Air Force base in Texas:

  - Connected to Mt. Sinai Hospital in New York.

  - Part of evaluation study to develop standardized monitoring system for hospitals with over 400 beds.

  - Claimed reduction of 12% to 0.2% in sudden critical complications for post operative cardiac patients.

  - System developed by Pacific Medical Center in conjunction with IBM.

  - Mt. Sinai used to be connected to PMC system but converted in-house.

- In Appalacia, 40,000 people are now served by a central pharmacy data base system:
  - Uses CRTs to link 10 hospitals to a central pharmacy.
  - Provides drug status review.
- American Health Corporation (New York) is owned by consortium of 7 companies (including CDC) providing multi-phasic testing facility.
- U.S. Public Health Service is building data banks to be used by screening facilities.
- Computer assisted tomography (CAT) and coronary care units will spread rapidly despite cost factors.
- Microcomputers will have more of an impact in this field than minicomputers; however, software is needed.
- In hospitals, it is necessary to have intra-site communications; i.e., among nursing stations, laboratories, pharmacy, and surgical operations:
  - Reliability and access are critical once a system is installed.
  - Central data bases must be available at multiple points.
  - Communications, however, starts to dominate the computer aspects.
- CRT-based systems are rapidly penetrating hospitals:
  - Blue Cross of Arizona provides Shared Hospital System to 14 hospitals using Datapoint 2000s for data entry.

- MEDICS from NCR is a computer/communications system for hospitals with 200-800 beds:
  - Runs $2.50-3.50 per patient day, including nursing stations.
- NCR also offers IHIS for hospitals with 50-200 beds, clinics, and group practices.
- IBM offers its Health Care Support/Order Communications System (OCS) to support computer/communications requirements.
- To small hospitals, IBM offers a turnkey System/32 which, however, does not handle Medicaid/Medicare billing as part of its industry applications software:
  - This indicates the problem with turnkey systems to hospitals.
  - Variation across hospitals and constant changes in reporting and administrative requirements make software maintenance a continuing problem.
- A vital consideration in medical services is that medical records are legal documents:
  - Handling of them provides a major office/computer opportunity.
- Anything that reduces malpractice insurance rates will be bought:
  - Groups of doctors have achieved lower rates by controlling activities performed by their members.
  - Such controls require data bases and transaction processing systems.

- Privacy aspect of medical data systems will cause needs for EDP to increase, in some cases, beyond the ability of in-house groups to respond. This could be a major sales point for services.

- Applications which will provide growth opportunities:

  - Inpatient drug profiles and administration.

  - Radiology scheduling and interpretation.

  - Medical records inventory control.

  - Patient and physician indices.

  - Handling of PSROs.

## 3. COMPUTER SERVICES MARKET FORECAST

- Fastest growing area for medical computer services is software packages, as shown in Exhibit V-22:

  - Turnkey systems of all types will spread rapidly in clinics, group practices, and hospitals.

  - Hospitals generally obtain more software from outside then they develop themselves.

  - Factors impeding market growth are tendency to share software and "free" software from mainframe vendors.

  - Vendors, notably IBM, will charge more for applications software and make more medical software available.

EXHIBIT V-22

## COMPUTER SERVICES MARKET FORECAST FOR MEDICAL INDUSTRY, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 20 | $ 23 | 15% | $ 29 | $ 40 | 12% |
| SCIENTIFIC & ENGINEERING | 1 | 1 | 10 | 3 | 5 | 31 |
| INDUSTRY SPECIALTY | 280 | 330 | 18 | 440 | 660 | 15 |
| UTILITY | 9 | 11 | 20 | 13 | 20 | 14 |
| TOTAL PROCESSING | $ 310 | $ 365 | 18% | $ 485 | $ 725 | 15% |
| SOFTWARE PRODUCTS | 20 | 25 | 25 | 45 | 85 | 27 |
| PROFESSIONAL SERVICES | 35 | 40 | 14 | 50 | 75 | 14 |
| TOTAL | $ 365 | $ 430 | 18% | $ 580 | $ 885 | 16% |

($ MILLIONS)

- Scientific and engineering processing is very small in the medical industry:
    - Will increase rapidly as medical research increases.
    - Universities are main suppliers to this market.
- Hospitals and clinics account for 75% of the industry specialty processing market. This proportion will reduce slightly to about 70% by 1982.
- Further detail on the market breakdown by provider type is given in Exhibit VI-5.
- User expenditures for general business processing are primarily for standard payroll and accounting packages.
- The number of hospitals using computer services for administrative applications will not expand significantly:
    - Hospitals with in-house systems will do more medical records/clinical work outside.
    - Expansion of services within existing customer base will provide expansion.
- In order to expand this market, vendors will have to provide on-site hardware for intra-site communications.
- The resource requirements to install the new computer/communications sytems will cause consolidation of the numerous small vendors to the industry.
- New entrants for standard services will have to "buy" their way in.
- Small hospitals (less than 100 beds) are not the best market for computer services:

  - Represent 50% of hospitals but only 12% of beds.

  - Will continue to do manual and small business computer processing.

  - Revenue too low for services companies ($1 per patient day).

  - Processing services expense often "too high" for hospital.

  - Payroll and billing applications are purchased from companies such as ADP and SBC.

- Hospitals with 500 beds or more are likely to use in-house computers for standard administrative applications; software, turnkey systems, and specialized RCS services will be purchased by them.

- INPUT projects that the average cost per patient-day for computer services to hospitals will increase from $2 ($500 per bed per year, assuming 70% bed utilization) to $4 ($1,000 per bed per year) by 1982.

- Market expansion will also come from HMOs, clinics, and group practices.

- HMOs will pay $1 per month per subscriber for EDP to handle enrollment and subscriber billing:

  - Some HMOs are large, Kaiser has 3,000,000 subscribers, HIP (New York) has 750,000.

  - As well as enrollment, there are certification and actuarial applications.

  - HMOs then have all the other medical and administrative processing requirements of the facilities, such as hospitals and clinics, embedded in them.

- Opportunites for services to physicians:
    - 10% of EDP users use RCS.
    - Practitioners spend 0.9% of gross for EDP if used.
    - 300/400 statements per month for $200 per month for batch services ($350 per month including insurance handling).
- Drug records and information on drugs major opportunity:
    - Physicians are bombarded with millions of words per year on drugs.
    - Drug interactions are increasing problem.
    - Addiction and other side effects increase liability.
- Patient information and records management opportunity with group practices.
- Lot of change in the single practitioner/small group market:
    - "Tough sell."
    - Banks are stong competition.
    - "Financial squeeze" reduces sales opportunities.
    - Minicomputers not a threat but microcomputers will be strong threat.
    - Right type of salesperson almost impossible to find.
- About 5% of hospitals report that they use facilities management now compared with less than 1% in 1970.

  - The rate is higher among hospitals over 100 beds.

  - Services provided by MCAUTO and Shared Medical Systems may be regarded as FM by some hospitals.

  - The trend will continue as the complexity of computer/communications applications and reporting requirements increase.

- In spite of apparent saturation in the major market segment, hospital processing services, there are major opportunities opening in this industry sector. Government concern and regulation will enable computer services to prosper here.

## 4. VENDOR ACTIVITIES

- ARTRONIX is a turnkey systems vendor applying the MUMPS operating system on DEC minicomputers for manufacturing as well as medical applications.

- Automatic Data Processing services 200 nursing homes through AUTONET:

  - Provides payroll services to over 150 hospitals.

  - 60 hospitals using financial packages.

- BDP in Vermont is another vendor using MUMPS on PDP11s: provides software for group practices. Also provides system based on IBM System/32.

- Blue Cross/Blue Shield associations are a major vendor group for services to physicians, groups, clinics, and hospitals:

  - Have several hundred hospital clients.

  - Blue Cross of Arizona services 14 hospitals.

  - Professional Operating Management Group (Boston subsidiary of Blue Shield) provides physician billing and analysis, outpatient medical information and patient record management.

- Compucare provides hospital FM:

  - Contract with Georgetown University Hospital (535 beds).

  - Working with 2 Data General Eclipse computers.

- Computer Consoles Inc. has a subsidiary (IMI Corp.) providing blood bank data.

- Computer Consulting Services has over 100 customers for medical billing and insurance services in 26 states.

- Computer Dynamics (Oakland subsidiary of Central Bank) does medical/dental billing in batch mode.

- Computer Synergy provides software packages in turnkey systems.

- Dikewood Industries services the health insurance (Medicaid) industry and also provides a system for Professional Standards Review Organizations (PSROs).

- Dun and Bradstreet Companies tried to move into this industry sector through acquisition of Medical Computer Systems:

  - MCS processes clinics and hospitals.

  - Revenues were over $9 million in 1976.

- Health Management Services is an example of the type of acquisition INPUT expects to see in this industry sector:

  - Acquired by Life Investors Co. of America, Inc. which has $300 million in assets.

  - Processes approximately 100 hospitals with over 10,000 beds.

  - Annual revenues of $5 million from hospitals.

  - Also serves 45 banks and insurance companies.

  - Installs minicomputers and programmable terminals at many client locations.

- Intellectron in Los Angeles serves primarily physicians:

  - Used to have 6 "sales" people, now has none.

  - Indicative of problems of "selling" to physicians.

- Kaman Sciences does medical clinic billing.

- Keane Associates operates KeaMed:

  - Provides FM services to 14 hospitals.

  - Acquired Innovations in Technology.

- MCAUTO is the leading vendor in services to hospitals:

  - Growth mainly internal whereas Shared Medical Systems has achieved part of growth through acquisition.

  - In 1975, MCAUTO served 315 hospitals with 69,000 beds and 705 terminals.

  - In 1976, it served 376 hospitals with 81,000 beds and 1,047 terminals.

  - Over 400 hospitals are now served and 1977 revenues from hospitals should be over $50 million.

  - Putting DEC computers into hospitals for clinical services; also has IBM System/7 interfaces.

  - Offers its mini based (distributed processing) system at incremental cost of $0.85-1.40 per patient day over normal administrative change.

  - Interfaces HDC with Hospital Financial Control (MCAUTO's major system) and, in future, with Hospital Patient Care (scheduling, etc.).

- Medical Data Services of Los Angeles has 45 hospital clients including 25 for which it performs patient accounting as well as general accounting.

- Medical Data Systems is a $3 million per year Tymshare subsidiary providing on-line financial services to hospitals and clinics.

- National Data Communications provides large hospital facilities management services.

- Northrup Data Systems provides turnkey systems for clinics, doctors, and hospitals.

- Optimum Systems, Inc. has a PSRO system with no significant revenues as yet.

- Professional Hospital Services is a subsidiary of American Medical International:

  - Offers PATCOM, a patient record accounting system.

  - "Bundles" it with management, education, and development.

  - Also has MEDI-DATA, a medical records system.

- Reliable Data Processing serves 2,800 physicians:
    - Averages $200 per month.
    - Growing 17% and 13% in last two years.
- The Reynolds and Reynolds Co. offers general accounting services to nursing homes, clinics, and physicians.
- Shared Medical Systems is the other major vendor to hospitals and clinics:
    - $35 million revenues in 1976.
    - Uses 370/168 processors.
    - Signed two hospitals with over 1,000 beds in 1976.
    - Installed ACTION, its interdepartmental communications system in two hospitals.
    - Could double revenues from existing customer base with this system.
    - Acquired business of GE Medinet (one of the earliest ventures into RCS applications processing).
    - Also acquired large part of business of American Hospital Supply Corp. and CB$^2$.
    - Endorsed by state and regional hospital and Blue Cross associations.
    - Primarily has 3 year contracts.
    - Over 350 hospital and physician group clients.

- Spectra Medical Systems, Inc. competes with Technicon on installation of major HIS (hospital information systems).

- Systems and Computer Technology offers facilities management to hospitals.

- System Development Corp. has some hospital FM.

- Technicon Medical Information Systems is a subsidiary Technicon acquired from Lockheed:

    - Hospital system costs $7-9 per patient day.

    - Generally recognized as "top-of-the-line" system but now aging in design concept.

    - 450 bed El Camino Hospital was "test-bed."

    - Has 370/155 with 57 CRTs.

    - Has enabled El Camino to show significant cost control and savings compared to similar hospitals.

    - Has 6 contracts altogether including development and demonstration contract.

- Telemed offers electrocardiogram processing using two DEC10s and two XDS Sigma 5s:

    - Installing Interdata minis as turnkey systems.

    - Setting up patient data record system.

- Worth, Auger and Associates are specializing in HMOs:
    - Using National CSS and NOMAD have developed CALL-MED/70 for HMOs.
    - Provides eligibility monitoring using cost and utilization data.
    - Supports certification process and government reporting.
    - Also working with Kaiser Permanente on clinical data base for improving health care delivery.

## I. EDUCATION

### 1. INDUSTRY CHARACTERISTICS

- Education is almost as large as the health industry, as shown in Exhibit V-23.
- However, it is not growing at the same rate:
  - Declining enrollment in primary schools.
  - Costs of higher education pushing it out-of-reach for many.
  - Voter resistance to increased taxes and bond issues are creating administrative problems.
  - Quality of education is also declining, as reflected by test scores.

### 2. USE OF EDP

- Colleges and universities are major users of computers:
  - For administration.
  - To support research.
  - Student use for computer education.
  - Student use in other areas.
- Conflict in use of automation with teachers:
  - Money for automation replaces teachers' salaries.

### EXHIBIT V-23

### EDUCATION INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 82 | ALL | TOTAL NUMBER OF EMPLOYEES (1974) | 943,000 |
| | ELEMENTARY AND SECONDARY | SCHOOL EXPENDITURES (1976)<br>ENROLLMENTS (1975)<br>NUMBER OF SCHOOLS (1974)<br>NUMBER OF SCHOOL DISTRICTS (1974) | $ 75 BILLION<br>51 MILLION<br>107,000<br>16,300 |
| | HIGHER EDUCATION | SCHOOL EXPENDITURES (1976)<br>ENROLLMENTS (1975)<br>NUMBER OF COLLEGES (1974) | $ 45 BILLION<br>10 MILLION<br>2,700 |
| | | | |
| | | | |
| | | | |

- More teachers than openings at schools and universities.

- Declining requirements for teachers but tenure ensures only oldest and least innovative retained.

- Computer will be used first in CMI (computer managed instruction) than in CAI (computer assisted instruction):

  - CMI is used for testing and progress measurement (costs $5 per student).

  - CAI involves working with students in the learning process (minimum cost $100 per student).

  - In Chicago, large systems are used for CAI; cost is $1.20 per hour.

- CAI leads to computer based education (CBE) with comprehensive involvement of computers in the education process.

- Federal government is sponsoring CAI development, especially in computer/telephone/TV interface areas:

  - Mitre developed a system called Tel-Catch.

  - HEW sponsoring CAI for handicapped.

  - Northern Virginia Community College has 2 DG Nova minicomputers connected to 128 modified TVs.

- CDC's PLATO is probably the leading example of what is possible with CAI/CBE now:

  - Has pilot at Houston Independent School District.

  - 30 learning centers equipped with PLATO terminals.
  - Being used at University of Delaware for music training; 32 terminals on campus.

- Royal College of Surgeons in Canada has on-line system for evaluation of decision making skills and medical knowledge.

- Training is a major EDP opportunity, for example, training of electric utility operations personnel:

  - When this is carried out outside schools, colleges, and independent training centers, such EDP revenues appear in the industry sector of the organization(s) carrying out the training.

- IBM emphasizes education market:

  - Terminal oriented package including course material development program needing no computer experience.
  - Sells IBM 5100 ($12,000) to schools as educational computer.

- One stumbling block has been the low level of involvement of teachers in curricular development programs by CAI/CBE vendors:

  - Vendors need to use educators.
  - However, must allow each educator to tailor courses.
  - Automation, again, would allow widespread distribution of a few leading texts.
  - Thus, a major source of income sought and achieved by many teachers would be cut off.

  - Major cause of resistance to CBE/CAI.

- Use of computer in education is an emotional issue; many regard it as an investment in our future; others oppose it as mechanical and dehumanizing.

- On the administrative side:

  - "Sharing" of software and processing is common in educational institutions.

  - County and municipal governments often perform EDP for school districts.

## 3. COMPUTER SERVICES MARKET FORECAST

- General business processing expenditures, shown in Exhibit V-24, are primarily for payroll and budgeting, primarily in batch mode:

  - Personnel and administrative applications will increase in importance.

  - Increased pressure on internal expenditures will result in increased use of services.

- Scientific and engineering processing expenditures are often with other universities or university "spin-offs" such as Uni-Coll:

  - Specialized applications are purchased to support research activities.

- Industry specialty activities include facilities management for colleges and universities:

  - This will be increasingly successful with more pressure on internal budgets.

EXHIBIT V-24

## COMPUTER SERVICES MARKET FORECAST FOR EDUCATION, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/ 76 % | 1979 | 1982 | AAGR 1977/ 82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 12 | $ 14 | 15% | $ 20 | $ 32 | 18% |
| SCIENTIFIC & ENGINEERING | 8 | 8 | 5 | 10 | 13 | 8 |
| INDUSTRY SPECIALTY | 28 | 34 | 20 | 48 | 78 | 19 |
| UTILITY | 18 | 20 | 10 | 29 | 27 | 7 |
| TOTAL PROCESSING | $ 66 | $ 76 | 15% | $ 107 | $ 150 | 15% |
| SOFTWARE PRODUCTS | 18 | 22 | 20 | 30 | 60 | 22 |
| PROFESSIONAL SERVICES | 31 | 34 | 10 | 38 | 40 | 5 |
| TOTAL | $ 115 | $ 132 | 15% | $ 175 | $ 250 | 14% |

($ MILLIONS)

  - Concept of selling FM to groups of colleges and schools will emerge.

- Other industry specialty services include student accounting and scheduling. Econometric forecasting services are also purchased by some colleges and universities.

- Because of the wide variation in EDP loading at various times during the year, it is often necessary for educational institutions to purchase utility processing services:

  - Modeling and program related activities also contribute to the RCS utility processing market.

- Software products purchases are largely systems package use:

  - Applications packages will increase more rapidly.

  - Many applications packages will be "free" from government or other institutions, however.

- Professional services are often for EDP consulting from accounting companies and management consultants:

  - Large school districts use outside development services at times.

- Colleges and universities are overall larger providers of computer services than users.

## 4. VENDOR ACTIVITIES

- CDC offers PLATO as a service as well as a product; however, it is expensive:

  - $15 per contact hour.

  - $6,000 per terminal.

  - $5 million for the total system.

- Most PLATO services use now is for demonstration and test purposes.

- Grumman Data Systems is entering the market; giving "free" programs to start.

- Systems Development Corporation has achieved small success in attacking the facilities management market for higher education establishments.

- Systems and Computer Technology has achieved notable success in the same market:

  - University of Miami has a 6 year $10 million contract.

  - University of Alaska has also a 6 year $10 million contract.

  - More than 75 colleges/universities as clients.

- Trilog was also developing this concept; its education activities were acquired by Pentamation Enterprises.

## J. RETAIL

### 1. INDUSTRY CHARACTERISTICS

- Automotive dealers and gasoline service stations are the largest component of this industry sector, as shown in Exhibit V-25:
  - Highest sales per employee.
  - Second largest number of establishments.
- Exhibit V-26 shows this industry sector to be composed mainly of small establishments:
  - 50 largest retailing companies had $133 billion in sales in 1976 (less than 20% of the industry total).
  - General merchandise and food stores, with automobile dealers, have 6,500 establishments with over $5 million in annual sales.
- Target industries based on establishment numbers and sales per individual are:
  - General merchandise stores.
  - Food stores.
  - Automobile dealers.
  - Building materials and hardware stores, to a smaller extent.

EXHIBIT V-25

RETAIL INDUSTRY SECTOR -

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | RETAIL TRADE | SALES (1974)<br>SALES (1977)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974) | $538 BILLION<br>$703 BILLION<br>1.2 MILLION<br>12.4 MILLION |
| 52 | BUILDING MATERIALS, HARDWARE | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 32.5 BILLION<br>61,000<br>441,000<br>$ 73,700 |
| 53 | GENERAL MERCHANDISE STORES | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 89.3 BILLION<br>43,000<br>2.0 MILLION<br>$ 45,100 |
| 54 | FOOD STORES | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $119.8 BILLION<br>160,000<br>1.8 MILLION<br>$ 65,500 |
| 55 | AUTOMOTIVE DEALERS AND GASOLINE SERVICE STATIONS | SALES (1974<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $141.3 BILLION<br>238,000<br>1.6 MILLION<br>$ 87,400 |

EXHIBIT V-25(CONT'D)

RETAIL INDUSTRY SECTOR -

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 56 | APPAREL AND ACCESSORY STORES | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 24.9 BILLION<br>111,000<br>847,000<br>$ 29,400 |
| 57 | FURNITURE, HOME FURNISHINGS, AND EQUIPMENT STORES | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 25.5 BILLION<br>80,000<br>513,000<br>$ 49,750 |
| 58 | EATING AND DRINKING PLACES | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 41.8 BILLION<br>261,000<br>3.1 MILLION<br>$ 13,500 |
| 59 | MISCELLANEOUS RETAIL | SALES (1974)<br>NUMBER OF ESTABLISHMENTS (1974)<br>NUMBER OF EMPLOYEES (1974)<br>AVERAGE SALES PER EMPLOYEE | $ 41.8 BILLION<br>234,000<br>1.6 MILLION<br>$ 26,500 |
|  |  |  |  |

EXHIBIT V-26

RETAIL ORGANIZATIONS -

DISTRIBUTION BY SIZE

| INDUSTRY SIC | INDUSTRY NAME | NUMBER OF ESTABLISHMENTS (SALES RANGE) BY NUMBER OF EMPLOYEES | | | |
|---|---|---|---|---|---|
| | | 1 - 99 | 100 - 249 | 250 - 999 | 1000 and Over |
| 52 | BLDG. MATERIALS, HARDWARE | 60,700<br>(UP TO $7.3M) | 112<br>($7.3M - $18.4M) | 10<br>($18.4M - $73.6M) | -<br>- |
| 53 | GENERAL MERCHANDISE STORES | 38,250<br>(UP TO $4.5M) | 3302<br>($4.5M - $11.2M) | 1598<br>($11.3M - $45 M) | 103<br>($45 M AND UP) |
| 54 | FOOD STORES | 159,200<br>(UP TO $6.5M) | 980<br>($6.5M - $16.3M) | 55<br>($16.4M - $65.4M) | 2<br>($65.5M AND UP) |
| 55 | AUTO. DEALERS AND GASOLINE SERVICE STATIONS | 237,180<br>(UP TO $8.7M) | 670<br>($8.7M - $21.8M) | 14<br>($21.9M - $87.3M) | -<br>- |
| 56 | APPAREL AND ACCESSORY STORES | 110,205<br>(UP TO $2.9M) | 300<br>($2.9M - $ 7.3M) | 55<br>($ 7.4M - $29.4M) | 2<br>($29.4M AND UP) |
| 57 | FURN., HOME FURN., AND EQUIPMENT STORES | 79,480<br>(UP TO $4.9M) | 160<br>($5.0M - $12.4M) | 19<br>($12.4M - $49.7M) | 2<br>($49.8M AND UP) |
| 58 | EATING AND DRINKING PLACES | 259,970<br>(UP TO $1.3M) | 1345<br>($1.4M - $ 3.4M) | 160<br>($ 3.4M - $13.5M) | 9<br>($13.5M AND UP) |
| 59 | MISCELLANEOUS RETAIL | 233,220<br>(UP TO $2.6M) | 375<br>($2.7M - $ 6.6M) | 65<br>($ 6.6M - $26.5M) | 24<br>($26.5M AND UP) |

## 2. USE OF EDP

- Few industries in this sector are well automated:
  - Automotive dealers, through computer services and increasingly turnkey systems.
  - Large retail chains such as Sears, Marcor, and Penneys.
  - Food chains such as McDonalds.
  - Some specialty establishments such as pharmacies and office products dealers.
- POS/EFTS is not moving as rapidly as many projected or hoped:
  - Item pricing controversy is slowing it down.
  - Union opposition to layoffs through automation.
  - Cost/benefit analysis not that favorable to it.
- "Stand-alone" electronic cash registers are a rapidly growing market:
  - Many POS terminals are really being used in this mode.
  - Data Terminal Systems, Inc. recognized the need and has been very successful with its "stand-alone" product.
  - Microprocessors will really impact minicomputers in this area: provide 90% of function at 50% of cost.
  - "Stand-alone" devices can later be linked to a central computer.

- Portable data capture devices (forerunner of the hand-held terminal) are increasingly being used for shelf and store inventory applications, particularly in food.

- Credit authorization, check guarantee/cashing, and eventually credit record updating is the fastest growing application area:

  - Classic distributed processing application.

  - Fraud is a major problem.

  - Issue of in-state control of credit records.

- Credit handling for retail outlets is a major automation area:

  - Problems related to credit are increasing because of privacy and security.

  - "Plastic" is proliferating.

  - All major retail outlets want to have their own lines into the credit business -- that's where the money is often made.

- Blurring of lines between the retail and banking industries will continue. Sears, for example, already operates a bank and recently purchased a large S&L in California.

## 3. COMPUTER SERVICES MARKET FORECASTS

- Credit handling is the major application group contributing to the size and growth of the industry specialized processing market, shown in Exhibit V-27:

EXHIBIT V-27

## COMPUTER SERVICES MARKET FORECAST FOR RETAIL, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 65 | $ 75 | 15% | $ 90 | $ 115 | 10% |
| SCIENTIFIC & ENGINEERING | - | - | - | - | - | - |
| INDUSTRY SPECIALTY | 210 | 250 | 20 | 350 | 540 | 17 |
| UTILITY | 40 | 45 | 12 | 55 | 75 | 11 |
| TOTAL PROCESSING | $ 315 | $ 370 | 17% | $ 495 | $ 730 | 15% |
| SOFTWARE PRODUCTS | 25 | 30 | 20 | 50 | 120 | 30 |
| PROFESSIONAL SERVICES | 35 | 40 | 20 | 55 | 100 | 19 |
| TOTAL | $ 375 | $ 440 | 17% | $ 600 | $ 950 | 17% |

($ MILLIONS)

  - Increasing problems in credit handling will create opportunities for "private label" processing of credit cards.

  - This will be done by banks and independent services companies.

  - Emergence of debit cards and integration of credit and checking accounts will increase opportunities for credit services.

  - Overlaps the retail and the banking and finance industry sectors.

  - Will become integrated with merchandising systems with the advent of full POS over next 5 years.

- Replacement of the batch processing of cash register tapes by remote batch processing of data stored in local terminals will shift batch revenues to RCS.

- Drop in price of POS terminals will cause virtually all stores to have them:

  - Opportunity for service to interface with variety of terminals from different manufacturers.

  - Consolidation of results from distributed stores and cash management will be a major reason for services use.

- Facilities management has not been successful with retailers. Some medium-sized chains will use it in future in order to keep up with competitors.

- General business services to retailers are primarily batch payroll and basic accounting:

  - These services will continue to grow primarily in RCS.

  - Cheaper data entry/output terminals (word processors) will facilitate this.

- Applications software, often in turnkey systems, will be a major target area in retail:
  - Consistency of requirements.
  - Impacted by credit and sales reporting regulation.
  - Lack of sophisticated internal staffs.
  - Need to control credit and cash in competition with banks.
- Professional services will have a relatively large growth in this sector:
  - Computer/communications applications requirements cannot be met internally.
  - Lack of internal capability to compete with banks.
  - Distributed processing, mini/micro development, network changes and increased privacy and security issues will create numerous consulting and systems development opportunities.

## 4. VENDOR ACTIVITIES

- Androcor, the BCS subsidiary, has had very limited success in providing services to retail stores such as F.A.O. Schwartz.
- ADP's dealer services is a major supplier of processing services to automobile dealers:
  - Offers batch, on-line, and turnkey systems.
  - Located Microdata/Reality systems on-site at several dealers.

  - This proved a problem because of software and the systems were withdrawn.

- Bank of America is, and will increasingly be, a major competitor in the retail services area:

  - Launching massive POS program for 30,000 commercial account customers.

  - Certifying NCR, TRW, and Sweda as qualified terminal suppliers.

  - Offering file storage and processing of customer accounts.

  - Linked to terminals owned by customers.

  - Targets are stores without POS terminals now and small chains without central resources.

  - Also will be major competitor to process retailers' credit cards, including those of oil companies.

- CDC has entered the "money" part of retailing with Telemoney:

  - Provides check authorization, verification, and guarantee services.

  - Limited cash card funds transfer.

- CDC also owns CRI Data Services which provides POS and data management services for retailers.

- Itel's Retail Management Services provides merchandising and accounting services to medium and small retailers.

- Itel (through Computer Dimensions) also services 4,000 automobile dealers with its dealer accounting services.

- National Data Corp. provides several retail services:

    - Working with automatic data collection from gas pumps for Atlantic Richfield (virtually the only gas station EDP opportunity).

    - Handles 28 million credit authorization calls per year.

    - Deposit reporting system being used by Taco Bell, Saga, and May Department Stores.

    - Has 20 pharmacies being served by on-line pharmacy management services.

- NCR Corporation is the largest supplier of retail processing services, except for credit:

    - 38 data centers with upgraded equipment.

    - Can poll stand-alone NCR 250 and 280 systems.

    - Estimates $3.6 million per year store would generate $2,400 per year of services excluding terminal costs (less than 0.1%).

- Pharmacy processors include several subsidiaries of drug companies:

    - Applied Health Care Systems (Louis Zahn Drug Co.) uses CRTs and printers at pharmacies.

    - Paid Prescriptions survived Health Applications Systems and concentrates on pharmacy processing.

  - Durr-Fillaneo Medical, Inc. is a distributor of pharmacy goods which also provides services.

  - MHDS (Informatics) provides on-line services.

- Reynolds and Reynolds provides processing services to automobile dealers:

  - Revenues of $34.6 million in fiscal year ending June 30, 1977, up from $25.3 million in 1976.

  - 6 regional EDP centers; offering minicomputer-based services in 125 cities.

  - 80% of revenues from automobile dealers from sources other than new car sales.

  - Have average 2 to 3 applications per dealer; will expand to 7 to 8.

  - Sold 110 VIM II minicomputer systems in first year; sales value $4 million.

  - VIM III has been added recently; sold 70 of this new, on-line system in 9 months.

  - Considers there are 75,000 dealers in U.S., 30,000 of whom are automobile dealers and their potential market is 15,000 of these.

  - Potential for 6 applications to each dealer giving 90,000 application/dealer installations.

  - Currently they have less than 10% (8,000) applications installed.

- TRW Credit Data is the largest supplier of automated consumer credit services in the U.S.:

  - Consumer credit authorization.

  - Has over 10,000 terminals in the field.

  - Has over 50,000,000 credit histories on file.

  - Establishing an in-store credit system with J.C. Penney.

- TRW also in business credit field offering services similar to those of Dun and Bradstreet.

- Other credit vendors include:

  - General Electric Credit Corp. provides credit authorization for over 400 stores and is working with Safeway.

  - Equi-Fax in Atlanta.

  - Telecredit, which provides check verification and insurance services, went from $10 million annual sales in 1975 to $14 million in 1976.

  - Trans Union Systems, Inc.

## K. WHOLESALE

### 1. INDUSTRY CHARACTERISTICS

- Only just over half the wholesale industry sector sales comes from merchant wholesalers, as shown in Exhibit V-28.

- Merchant wholesalers, however, account for over 80% of the wholesale distribution establishments:

    - Manufacturers sales branches account for 30% of sales but only 10% of establishments.

    - Petroleum bulk terminals, merchandise agents and brokers, and farm products assemblers account for the remainder.

- Average sales per employee in this sector are among the highest:

    - Non-durable goods sales per person are double those in the durable goods wholesale industry, as shown in Exhibit V-29.

    - In farm products (raw materials), industry average sales per person are over $400,000.

- There are 10,000 merchant wholesaler establishments with annual sales over $5 million, as shown in Exhibit V-30. There are 1,500 prime targets with sales over $20 million.

- Average sales per establishment overall is about $1.5 million.

- Target industries are those with above average sales per establishment yet middle range sales per employee:

## EXHIBIT V-28

## WHOLESALE INDUSTRY SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | SALES: TOTAL (1975) | $840 BILLION |
| | | SALES: MERCHANT WHOLESALERS (1975) | $439 BILLION |
| | | NUMBER OF ESTABLISHMENTS: TOTAL (1974) | 351,000 |
| | | NUMBER OF ESTABLISHMENTS: MERCHANT WHOLESALERS (1972) | 290,000 |
| 50 | DURABLE GOODS | SALES (MERCHANT WHOLESALERS) (1975) | $186 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 200,000 |
| | | NUMBER OF EMPLOYEES (1974) | 2.5 MILLION |
| | | SALES BREAKDOWN (MAJOR CATEGORIES 1975) | |
| | | MOTOR VEHICLES, AUTOMOTIVE EQUIP. | $ 33.6 BILLION |
| | | ELECTRICAL GOODS | $ 24.2 BILLION |
| | | FURNITURE, HOME FURNISHINGS | $ 6.7 BILLION |
| | | HARDWARE, PLUMBING, HEATING EQUIPMENT, ETC. | $ 17.2 BILLION |
| | | LUMBER, CONSTRUCTION MATERIALS | $ 15.9 BILLION |
| | | MACHINERY, EQUIPMENT, SUPPLIES | $ 51.8 BILLION |
| | | METALS, METALWORK (EXCEPT SCRAP) | $ 25.1 BILLION |
| | | SCRAP, WASTE MATERIALS | $ 8.6 BILLION |

## EXHIBIT V-28 (CONT'D)

## WHOLESALE INDUSTRY SECTOR-
## DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 51 | NON-DURABLE GOODS | SALES (MERCHANT WHOLESALERS) (1975) | $253 BILLION |
| | | NUMBER OF ESTABLISHMENTS (1974) | 151,000 |
| | | NUMBER OF EMPLOYEES (1974) | 1.8 MILLION |
| | | SALES BREAKDOWN (MAJOR CATEGORIES 1975) | |
| | | GROCERIES AND RELATED PRODUCTS | $ 89.8 BILLION |
| | | BEER, WINE, DISTILLED ALCOHOLIC BEVERAGES | $ 20.2 BILLION |
| | | DRUGS, CHEMICALS, ALLIED PRODUCTS | $ 15.1 BILLION |
| | | TOBACCO, TOBACCO PRODUCTS | $ 8.5 BILLION |
| | | DRY GOODS, APPAREL | $ 15.5 BILLION |
| | | PAPER, PAPER PRODUCTS (EXCL. WALLPAPER) | $ 11.5 BILLION |
| | | FARM PRODUCTS (RAW MATERIALS) | $ 44.4 BILLION |

## EXHIBIT V-29

## WHOLESALE INDUSTRY ORGANIZATIONS DISTRIBUTION BY SIZE

| NUMBER OF EMPLOYEES | SALES RANGE | NUMBER OF ESTABLISHMENTS |
|---|---|---|
| DURABLE GOODS (SIC 50): AVERAGE SALES PER EMPLOYEE $75,500 | | |
| 1 - 249 | $ 75,500 - 18,799,500 | 199,387 |
| 250 - 499 | $ 18,875,000 - 37,674,500 | 335 |
| 500 - 999 | $ 37,775,000 - 77,422,500 | 101 |
| 1000 - 1499 | $ 77,498,000 - 116,172,500 | 14 |
| 1500 - 2499 | $116,248,000 - 188,674,500 | 5 |
| 2500 - 4999 | $188,750,000 - 377,424,500 | 1 |
| NON-DURABLE GOODS (SIC 51): AVERAGE SALES PER EMPLOYEE $143,500 | | |
| 1 - 249 | $ 143,500 - 35,731,500 | 151,025 |
| 250 - 499 | $ 35,875,000 - 71,606,500 | 237 |
| 500 - 999 | $ 71,750,000 - 143,356,500 | 55 |
| 1000 - 1499 | $143,500,000 - 215,106,500 | 12 |
| 1500 - 2499 | $215,250,000 - 358,606,500 | 3 |
| 2500 - 4999 | $358,750,000 - 717,356,500 | 1 |

## EXHIBIT V-30

## MERCHANT WHOLESALERS
## DISTRIBUTION BY SIZE

| ANNUAL SALES RANGE ($MILLION) (1972) | NUMBER OF ESTABLISHMENTS | TOTAL SALES ($BILLION) |
|---|---|---|
| LESS THAN 1 | 209,000 | $ 66 |
| 1 - 5 | 57,000 | 116 |
| 5 - 10 | 6,400 | 44 |
| 10 - 20 | 2,500 | 34 |
| OVER 20 | 1,500 | 78 |
| NOT OPERATED ALL YEAR | 13,800 | 16 |
| TOTAL (ROUNDED) | 290,000 | $354 |

- Motor vehicles, automotive equipment.

- Electrical goods.

- Beer, wine, and spirits.

- Drugs, chemicals.

- Lumber, construction materials.

- Groceries and related products.

## 2. USE OF EDP

- Since a 50 person company can have sales of $10 million or more, EDP use in merchant wholesalers has been limited:

  - Most applications can be easily handled manually.

  - Most companies are privately owned by relatively unsophisticated people, in a management sense.

- The major use of EDP has been for payroll and billing services; accounts receivable being more important than payroll.

- Now order entry and inventory control are becoming increasingly recognized as applications demanding EDP systems.

- Cooperatives are being formed. For example, a grocer cooperative in Kansas City and Springfield, MO supplies 58% of all wholesale grocers in Kansas City with EDP.

## 3. COMPUTER SERVICES MARKET FORECAST

- Virtually every general batch services company obtains significant revenues from this industry sector.

- Limited, but specific, demand for EDP by wholesalers has enabled computer services companies to penetrate this sector more effectively than equipment suppliers.

- Now, however, turnkey systems and small business computers are being sold strongly to the 350,000 wholesale establishments.

- New EDP users are choosing services and in-house hardware; however, larger services users are migrating to in-house hardware in many cases.

  - Cheaper terminals will enable services companies to "push down" sales to smaller wholesalers.

  - Many wholesalers are relatively stable in terms of goods distributed, suppliers, and clients, hence volatility of applications is low, thus favoring in-house hardware.

  - RCS should be targeted on the over $20 million company with multiple distribution and sales points in competitive industry areas.

- Remote computing services companies will put intelligence on-site at larger clients:

  - Reduces communications costs.

  - Enables users to get some on-site inquiry and report facilities.

- Facilities management wil more than double in the next five years from:

  - Medium-sized companies with relatively complex computer/communications applications.

  - Companies running into problems with the performance and management of their on-site equipment.

- "Buying" data bases will be an opportunity for RCS, where sources and locations of products are made available to distributors and retailers.

- General business is the largest processing services market and will remain so as shown in Exhibit V-31:

  - Some data entry is performed remotely; reports and transactions are provided in batch mode.

  - Majority of expenditures is by small distributors (less than $10 million in annual sales).

  - Many of these companies will continue to do their basic accounting for several hundred dollars per month.

- Industry specialized services are primarily RCS:

  - They do not include expenditures by manufacturing companies for distribution services.

  - On-line order entry, shipping instruction distribution, and inventory control are the prime applications.

  - Growth rates in some sub-sectors will be over 25% per year.

- Because of the variety of distributors, much of the current batch work is customized:

EXHIBIT V-31

## COMPUTER SERVICES MARKET FORECAST FOR WHOLESALE, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AACR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 128 | $ 140 | 10% | $ 175 | $ 249 | 12% |
| SCIENTIFIC & ENGINEERING | - | - | - | - | - | - |
| INDUSTRY SPECIALTY | 98 | 110 | 13 | 145 | 229 | 15 |
| UTILITY | 82 | 90 | 10 | 105 | 136 | 9 |
| TOTAL PROCESSING | $ 308 | $ 340 | 10% | $ 425 | $ 614 | 12% |
| SOFTWARE PRODUCTS | 39 | 48 | 25 | 75 | 150 | 25 |
| PROFESSIONAL SERVICES | 33 | 37 | 12 | 45 | 66 | 12 |
| TOTAL | $ 380 | $ 425 | 12% | $ 545 | $ 830 | 14% |

($ MILLIONS)

  - Most future processing will involve packaged services.

  - Business growth from "locked-in" users and use of DBMS tools for custom applications will cause growth to continue.

- Applications software products will grow very strongly (close to 30% per year) in this industry sector due to:

  - Spread of small business computers.

  - Software from manufacturers such as IBM.

  - Turnkey systems sales.

- Professional services expenditures by users are often in conjunction with processing services.

## 4. VENDOR ACTIVITIES

- ADP provides wholesalers with general and specialized services:

  - Autonet serves 200 wine and spirit, and other wholesalers.

  - Dealer Services provides services to automobile and automotive equipment distributors as well as dealers.

- CMS Industries uses DARTS (proprietary package) on an IBM 370/145 under CICS for wholesale distributors (75% of service is interactive).

- Custom Computer Services (Sacramento, CA) is an example of a new vendor:

  - Uses Basic Timesharing 4000 minicomputer.

  - Has variety of local, distribution clients.

  - Reducing clerical problems for them.

- Distronics is a small ($2 million per year) subsidiary of Western Union serving plumbing and heating (60), electrical, air conditioning, and piping suppliers:

  - On-line services from multiple processing centers.

  - Replacing in-house computers in some cases.

- Informatics acquired Management Horizons Data Systems, Inc.:

  - $8 million per year.

  - IBM 370 based on-line services.

  - Drug, food, and building material suppliers.

- Itel Data Services provides a variety of services to wholesalers:

  - Turnkey, batch, and on-line general business systems.

  - Computer Dimensions also provides services to automotive parts distributors.

  - CDSI provides industry specialized distributor services.

- Keydata is the old-established vendor of industry specialized RCS to wholesalers:

  - 1976 revenues of $15 million.

  - Being hurt by small business computers.

  - System 800 aimed at $0.75 million to $5 million companies at $800 per month.

  - Generally dealing with too small companies.
  - Serves Panasonic's 5 regional and 1 central locations.
  - Replacing some in-house computers.
- Particular Keydata client example of what will happen in many areas in future:
  - Was Keydata client.
  - Went in-house on DEC PDP11.
  - New controller came in and they returned to Keydata.
  - Reason was downtime on the PDP11; they never knew what the problem was, hardware or software.
- Marchbanks and Parke, Inc. provides software to bottlers.
- MCAUTO uses CO-OP, its IMS-based system, to support large companies with warehouses and inventories at distributed locations.
- Scientific Computers (Minneapolis) providing on-line distribution services.
- System Development Corporation has wholesale distribution services through IBM System/370 Model 158 based service and Stockmaster, a Computer Automation based turnkey system.
- Tymshare through United Data Centers provides:
  - General business services through batch data centers.
  - Specialized services ($4 million per year) to oil dealers through Computafuel and Telefuel (Simplified Data Processing).

- United Computing Services has entered the wholesale distribution market by providing a remote minicomputer linked to its central processing facilities. Each user of the minicomputer can also act as a distributor of services to other local companies.

## L. FEDERAL GOVERNMENT

### 1. INDUSTRY CHARACTERISTICS

- Federal government growth has accelerated markedly in the last several years:
  - From 1969 through 1974, fiscal year growth averaged considerably less than 10%.
  - Since 1975, growth averages nearer 20%.
- Greatest contribution to this growth comes from income security which has trebled in size between 1970 and 1977, as shown in Exhibit V-32.
- Over two-thirds of the growth in this period comes from programs that pay people directly, or indirectly for services.

### 2. USE OF EDP

- In the same period that the federal budget has expanded by over 90%, EDP expenditures in the general management classification have increased by only 59%:
  - General management classification federal EDP costs were $3.2 billion in 1976.
  - Special management classification EDP costs are for control, classified and mobile operations.
  - Special management computers have increased in number from 2,545 in 1971 to 5,027 in 1975, and in value from $0.8 billion in 1971 to $1.15 billion in 1975.

## EXHIBIT V-32

## FEDERAL GOVERNMENT INDUSTRY SECTOR

## DEMOGRAPHIC DATA

| TYPE OF STATISTIC | DATA | | |
|---|---|---|---|
| NUMBER OF EMPLOYEES (1976) | 2.8 MILLION | | |
| RECEIPTS (1975) | $285 BILLION | | |
| EXPENDITURES (1975) | $357 BILLION | | |
| BUDGET OUTLAYS BY FUNCTION 1965 - 1976 | ($ BILLIONS) | | |
| | 1965 | 1970 | 1976 |
| TOTAL BUDGET OUTLAYS | $118.4 | $196.6 | $373.5 |
| NATIONAL DEFENSE | 48.6 | 79.3 | 92.8 |
| HUMAN RESOURCES | 35.4 | 72.7 | 198.5 |
| INCOME SECURITY | 25.7 | 43.1 | 128.5 |
| HEALTH | 1.8 | 13.1 | 32.1 |
| VETERANS BENEFITS AND SERVICES | 5.7 | 8.7 | 19.0 |
| EDUCATION, TRAINING, EMPLOYMENT, AND SOCIAL SERVICES | 2.1 | 7.9 | 18.9 |
| OTHER NON-DEFENSE | 34.5 | 44.6 | 82.2 |
| PHYSICAL RESOURCES | 15.1 | 21.5 | 38.3 |
| COMMERCE AND TRANSPORTATION | 6.9 | 9.1 | 17.8 |
| NATURAL RES., ENVIRON., AND ENERGY | 3.2 | 4.0 | 11.8 |
| COMMUNITY AND REGIONAL DEVELOP. | 1.1 | 3.2 | 5.8 |
| AGRICULTURE | 3.9 | 5.2 | 2.9 |
| NET INTEREST | 8.6 | 14.4 | 26.8 |
| ALL OTHER | 10.7 | 8.8 | 17.1 |

  - In the same period, general management computers have increased from 3,389 to 3,622 and in value from $2.3 billion to $2.9 billion.

- While reported EDP expenditures are just over $4 billion (inlcuding the expenditures for special management equipment), total federal EDP expenditures may be closer to $14 billion:

  - Up to $10 billion unreported.

  - Federally financed EDP to grantees and contractors.

  - Special purpose EDP equipment and services in non-EDP operations.

- General Services Adminstration is the agency that has increased its EDP costs the fastest since 1970, as shown in Exhibit V-33:

  - Its proportionate share of the federal installed computer base (in number) declined in the same period from 0.8% to 0.3%.

  - Growth reflects a change in the types of computers to large remote processing systems.

- GSA is increasingly trying to act as the EDP procurement agency for the federal government.

- Since new computers are often purchased by the federal government, large procurements tend to distort EDP budget figures; for example, GSA's EDP budget was $65 million in 1975 and only $40 million in 1976.

- Most agencies are projecting EDP budget increases: for "social" agencies, such as HUD and HEW, growths of 10% to 15% per year are expected.

- Agencies, particularly Commerce, HEW, VA, and ERDA expect secondary processor and minicomputer installations to rise sharply in the next several years.

EXHIBIT V-33

## FEDERAL GOVERNMENT EDP COSTS BY AGENCY
## GENERAL MANAGEMENT CLASSIFICATION

| AGENCY | FY 1970 ($MILLIONS) | FY 1976 ($MILLIONS) | PERCENTAGE OF FY 1976 COST | GROWTH FY 1970 TO FY 1976 |
|---|---|---|---|---|
| AGRICULTURE | $ 26 | $ 51 | 1.6% | 96% |
| COMMERCE | 39 | 95 | 3.0 | 144 |
| DEPARTMENT OF DEFENSE | 1,281 | 1,633 | 51.2 | 27 |
| ENERGY R. & D. ADMINISTRATION | 130 | 200 | 6.3 | 54 |
| GENERAL SERVICES ADMIN. | 14 | 40 | 1.3 | 186 |
| HEALTH, EDUCATION, & WELFARE | 94 | 252 | 7.9 | 168 |
| INTERIOR | 17 | 40 | 1.3 | 135 |
| NATIONAL AERO. SPACE ADMIN. | 172 | 160 | 5.0 | ( 7) |
| TRANSPORTATION | 17 | 44 | 1.4 | 159 |
| TREASURY | 205 | 453 | 14.2 | 121 |
| VETERANS ADMINISTRATION | 40 | 60 | 1.9 | 50 |
| OTHER CIVIL | 90 | 160 | 5.0 | 78 |
| TOTAL COST | $2,125 | $3,188 | 100.0% | 50% |

- Of the agencies using large IBM mainframes, few are using latest IBM software:
  - Large systems are on OS rather than MVS.
  - IMS is much less used than in large commercial installations.
  - Other DBMS use is fairly common, particularly TOTAL which offers some degree of portability.
  - Network software is non-standard; custom software and independent packages are most often used.
- Applications required in all agencies are primarily analytical and planning in nature:
  - Management information is increasingly in demand.
  - New regulation and enforcement are creating major reporting requirements.
  - Again, agencies are looking to EDP analysis tools to work with these reports, rather than simply "file" them as has happened to many of them in the past.
- Significantly, agencies view their major problem in the EDP area as dealing with government red tape.

## 3. COMPUTER SERVICES MARKET FORECASTS

- The major factor affecting the use of computer services in the federal government is the extend to which OMB Circular A-76 is implemented:

  - A-76 points out that it is the policy of the federal government to rely on the private enterprise system to satisfy its needs for products and services.

  - In the area of data processing, agencies have not complied with this principle.

  - Under the policy of A-76, "direct procurement of services, with all the associated functions being performed in the private sector, is the preferred alternative for meeting data processing requirements."

  - A Transmittal Memorandum relative to Circular No. A-76 stated that, "Government ADP requirements normally will be expressed in terms of the services to be performed, rather than the equipment and software to be used in performing these services."

  - A recent APL timesharing services procurement stated: "This solicitation is subject to a cost comparison to determine the economic feasibility of accomplishing the specified workload in-house or by contract."

- The issue is how objective will the evaluation be of external vs. internal proposals:

  - Also, the cost of marketing could be made prohibitive by splitting applications or services up and asking for bids in this manner.

  - Vendors must win some in order to be convinced agencies are "for real."

- Many computer services vendors are negatively disposed toward government business:

  - Takes too long and is too costly to sell in competition with entrenched vendors like CSC.

  - Too much "red tape."
  - Bidding is an expensive process.
  - Profitability of work is low because of price competition and discount schedules.

- If this circular was fully implemented forthwith, the impact on the computer services markets would be substantial:

  - Assuming all growth was provided through computer services, average of 8% growth per year on $3.2 billion EDP expenditures would increase the 1977 computer services market by $240 million (a growth rate of 33%).
  - 33,000 person years of systems design and programming would be open for replacement.
  - 15,000 person years of data entry time would similarly be open for replacement.
  - Total replaceable EDP costs in 1976 for equipment, site, and operations would be approximately $2 billion.

- Certain amounts of this processing, for example, entry of tax returns for IRS, could only be contracted out under stringent security restrictions, but a private facility is not necessarily less secure than a "commercial" government facility.

- The above figures already exclude all classified processing.

- The only parts of the 1976 federal EDP budget that would remain in-house would be:

  - $200 million of staff and administrative functions (100% increase in managing outside services should be more than offset by reduction in personnel and other administrative functions).

  - $115 million of supplies transferred at same rate.

  - $500 million of EDP expenses deemed difficult to transfer because of the "national interest" or cheaper federal government processing.

- In this context, the average salary, without benefits, of government EDP workers, including operators, keypunchers, and clerical staff who make up two-thirds of the personnel, is $14,612.

- Increase in expenditures for personnel salaries accounts for 53% of the increase in federal EDP budgets since 1970.

- In view of this potential growth, INPUT's forecasts in Exhibit V-34 must be regarded as conservative; however, there are negative factors:

  - Opposition by Civil Service and other vested interests will slow the move.

  - Any transfer will take time and require some cooperation from federal EDP management which will usually be given grudgingly at best.

  - Continuous monitoring and driving will be required to make it happen; neither GSA nor anyone else has the "muscle" to make it happen rapidly.

  - Ability of vendors to absorb the work is limited: too precipitous a transfer with attendant problems would end-up with reversing the trend.

- The $1.9 billion market in 1982 represents about a 40% penetration of federal EDP costs compared to approximately 20% now.

EXHIBIT V-34

## COMPUTER SERVICES MARKET FORECAST FOR FEDERAL GOVERNMENT, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| **PROCESSING SERVICES** | | | | | | |
| GENERAL BUSINESS | $ 15 | $ 18 | 20% | $ 26 | $ 45 | 20% |
| SCIENTIFIC & ENGINEERING | 144 | 160 | 11 | 194 | 255 | 10 |
| INDUSTRY SPECIALTY | 12 | 14 | 17 | 20 | 35 | 20 |
| UTILITY | 264 | 318 | 20 | 465 | 825 | 21 |
| TOTAL PROCESSING | $ 435 | $ 510 | 17% | $ 705 | $ 1,160 | 18% |
| SOFTWARE PRODUCTS | 40 | 45 | 15 | 60 | 100 | 17 |
| PROFESSIONAL SERVICES | 255 | 330 | 29 | 440 | 620 | 16 |
| TOTAL | $ 730 | $ 885 | 21% | $1,205 | $ 1,880 | 17% |

($ MILLIONS)

- The area in which the fastest growth is possible is that of professional services which has grown by close to 30% per year over the last several years. However, this will slow as resistance mounts internally and growth of professional services starts to eat into the base of internal business affecting federal jobs.

- INPUT has found, however, strong supporters of services in some government agencies. These are generally people who want to "get things done!"

- In the RCS area, the TSP procurement has been promoted by GSA as the prime example of the implementation of A-76:

    - Growth of "timesharing" is projected by OMB from $182 million in 1976 to $223 million in 1977 and $242 million in 1978.

    - This understates the total growth of RCS to the federal market which will average 25% per year over the next 5 years.

- Under the TSP contracts, federal EDP was supposed to be geared to numerous commercial vendors:

    - Terms of the contract and agency interpretations have resulted in little recompetition of current contracts.

    - Discounts received by the federal government under TSP may often be less than they could otherwise have received.

    - New contracts require as much or more marketing as commercial contracts yet vendor discounts are expected because of economies of scale which are only meaningful to the major vendors.

    - The "red tape" and resistance involved may well make TSP fail, just as the GSA Region 3 Basic Ordering Agreement for professional services failed.

- New agencies will tend to use facilities management to achieve their processing requirements:
  - Small agencies, also, may choose the FM route.
  - Larger agencies will try to give out their processing in bits and pieces to slow things down.
  - Current large users of FM such as NASA and ERDA have their EDP requirements generally growing more slowly than other agencies.
  - INPUT expects that FM will double in the next 5 years to $460 million in 1982.
- As the government moves towards services the major computer vendors will also move into the market:
  - In the 1980s, IBM will offer support services.
  - It will have to in order to compete in the market.
  - However, since it now does proportionately better through FM contracts than it does in equipment procurements, outside DOD, it will not enter the fray immediately in 1979.
- "Privacy" is the major weapon agencies will use to keep their processing and people. Vendors can and must address this positively.
- Although most of the processing services purchased by the federal government are classified as "utility," the government requires more industry specialized marketing and sales than any other.
- Most of the scientific and engineering processing purchased is for facilities management by NASA, ERDA, and other technical agencies.

- Systems products form by far the largest part of the software products market. However, growth is slower here than in many sectors because of the government's **proclivity for** developing its own software, even to the extent of DBMS. "Sharing" of software is also an impeding factor.

- Professional services expenditures do not include grants and contracts for research, which probably total several hundred million dollars, primarily, going to universities and research organizations like SRI, Mitre, and A.D. Little.

- Education expenditures total over $20 million a year and are expanding rapidly.

## 4. VENDOR ACTIVITIES

- American Management Systems places heavy emphasis on systems development for the federal government. It also operates a data center with $2 million per year revenues from the federal governemnt.

- BCS is one of the largest vendors of IBM-based remote computing services to the government with over $8 million in 1977.

- Computer Data Systems, Inc. with $6 million total revenues has a $2.3 million Navy contract.

- COMNET has achieved great success in the last year primarily in obtaining large, FM contracts; it now has over $40 million in multi-year FM contracts.

    - Price and availability are the major sales points.

    - COMNET may well run into performance problems because of the rapid increase.

- Computer Sciences Corporation is the leading computer services vendor for both RCS and professional services:

- For FAA, develops air traffic control systems for 1,800 people at National Aviation Facilities Experimental Center.

- Developing TRIMIS (Tri-Service Medical Information System) for DOD under $20 million, 5 year contract.

- TRIMIS will be installed for the 200 military hospitals/clinics.

- Hospital Affiliates International is the leading subcontractor. It owns 25 hospitals and manages 50 others.

- Has 45 people for Marine Corps. Tactical Systems Support.

- INFONET has a zero base budget model which should do well with the change in budgeting methodology in and out of the government.

- Together with Western Union and Aeronutronic Ford, CSC has a $104 million data network contract (AUTODIN II) with DCA; CSC's share is $9 million.

- $3 million, 3-year contract for computer/communications facilities management at the Nevada Operations Office of ERDA.

- $3 million per year contract with ERDA to provide management systems to support research and development through the Office of Program Management Support.

- Several million dollar per year contract with EPA to provide EDP support system for management.

- $40 million, 3-year contract with NASA to provide computer/communications systems related to space shuttle program.

  - $28 million, 4-year sub-contract from RCA for the AEGIS ship combat system.

- CSC's INFONET contract with GSA expired on September 30, 1977. However, users will shift to TSP contract at little cost to CSC and will not necessarily recompete for up to 3 years.

- Control Data Corporation is a major supplier of RCS and some professional services:

  - Concentrates on technical agencies.

  - Has $1 million Cybernet contract with TVA for nuclear energy environment analysis.

- Informatics has 500 people working for NASA; runs operations of ILLIAC IV at Ames.

- Kappa Systems ($9 million) has a contract with HEW to develop a management information system for quality assurance in PSROs.

- Litton provides program development and IBM processing services.

- Optimum Systems Inc. has recently been hurt by losing large contracts to Comnet. It continues to concentrate on large FM contracts to agencies like FTC, FEA, and EPA.

- PRC Information Sciences and Data Services Companies primarily market to the federal government; it is a leader in these areas.

  - PRC/IS concentrates on advanced computer/communications network development and micrographics.

- Science Applications, Inc. provides software development; also concentrates on integration contracts.

- At least 50 RCS vendors are on the GSA TSP schedule under the basic agreement. However, fewer have qualified under the Multiple Award Schedule which provides for major contract competition.

- Among these are several vendors that do little or no commercial RCS.

## M. STATE AND LOCAL GOVERNMENT

### I. INDUSTRY CHARACTERISTICS

- State and local government expenditures in 1975 were over 60% of those of the federal government:
  - They have 4 times as many employees as the federal government.
  - As shown in Exhibit V-35, there are over 66,000 such organizations.
- Education is by far the largest category of general expenditure, with public welfare, highways, and medical functions the next largest categories.

### 2. USE OF EDP

- In state government, unemployment is the major expense area:
  - Division of Employment Security often has its own computer center operated with federal funds.
  - Job banks are becoming increasingly important.
  - On-line systems using terminals for inquiry into these data bases are growing; one state has 500 terminals connected to such a system.
- EDP costs in state government average about 0.6% of total expenditures, with a range from 0.3% to 1.9%.
- In the health area, states obtain 90% federal funding for approved development of Medicaid systems; they get 50% federal funding for operation of approved systems.

EXHIBIT V-35

# STATE AND LOCAL GOVERNMENT INDUSTRY SECTOR - DEMOGRAPHIC DATA

| TYPE OF STATISTIC | DATA |
|---|---|
| REVENUES (1975) | $233 BILLION |
| EXPENDITURES (1975) | $223 BILLION |
| NUMBER OF EMPLOYEES (1975) | 12 MILLION |
| NUMBER OF STATES (1977) | 51 |
| NUMBER OF COUNTIES (1972) | 3,044 |
| NUMBER OF MUNICIPALITIES (1972) | 18,517 |
| NUMBER OF TOWNSHIPS | 45,948 |

EXPENDITURES BY FUNCTION (1974)

| FUNCTION | EXPENDITURES | PERCENT |
|---|---|---|
| DIRECT GENERAL EXPENDITURE | $198,618 | 88.0% |
| EDUCATION | 75,833 | 33.5 |
| INSTITUTIONS OF HIGHER EDUC. | 18,884 | 8.4 |
| LOCAL SCHOOLS | 53,059 | 23.5 |
| HIGHWAYS | 19,946 | 8.8 |
| PUBLIC WELFARE | 24,745 | 11.1 |
| HEALTH | 3,452 | 1.5 |
| HOSPITALS | 12,493 | 5.5 |
| POLICE PROTECTION | 7,289 | 3.2 |
| LOCAL FIRE PROTECTION | 3,037 | 1.3 |
| NATURAL RESOURCES | 3,661 | 1.6 |
| SANITATION AND SEWERAGE | 5,995 | 2.7 |
| HOUSING AND URBAN RENEWAL | 3,461 | 1.5 |
| LOCAL PARKS AND RECREATION | 2,951 | 1.3 |
| FINANCIAL ADMINISTRATION | 3,165 | 1.4 |
| GENERAL CONTROL | 4,371 | 1.9 |
| INTEREST ON GENERAL DEBT | 7,666 | 3.4 |
| UTILITY AND LIQUOR STORES EXPEND. | 14,406 | 6.4 |
| WATER SUPPLY SYSTEM | 4,669 | 2.1 |
| ELECTRIC POWER SYSTEM | 4,152 | 1.8 |
| TRANSIT SYSTEM | 3,161 | 1.4 |
| GAS SUPPLY SYSTEM | 505 | 0.2 |
| LIQUOR STORES | 1,919 | 0.8 |
| INSURANCE TRUST EXPENDITURE | 12,667 | 5.6 |
| EMPLOYEE RETIREMENT | 6,639 | 2.9 |
| UNEMPLOYMENT COMPENSATION | 4,703 | 2.1 |

($ MILLIONS)

- Sometimes approval costs so much, states decide its not worth the extra cost.

- For local government, apart from schools, police, taxes, and sanitation are the most important EDP users.

- Over $1 billion per year is spent in local government EDP.

- Joint ventures in local government are fairly common; for example, six cities in Orange Country combined resources.

- In local government, computer/communications systems are particularly needed to support social programs.

- Counties spend 1.7% to 2% of their budgets on EDP.

- Cities typically spend 1.1% of their budgets on EDP.

  - 350 municipalities with 50,000 to 500,000 people.

  - With less than 100,000 people, municipalities use service bureaus and small business computers.

## 3. COMPUTER SERVICES MARKET FORECASTS

- This is a major opportunity area for processing services.

  - Compared with other industry sectors computer services penetration is low.

  - Industry specialty processing will provide the greatest opportunity as shown in Exhibit V-36, as RCS is increasingly used for planning and control purposes.

EXHIBIT V-36

## COMPUTER SERVICES MARKET FORECAST FOR STATE AND LOCAL GOVERNMENT, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 13 | $ 16 | 20% | $ 25 | $ 45 | 23% |
| SCIENTIFIC & ENGINEERING | 3 | 4 | 30 | 8 | 18 | 35 |
| INDUSTRY SPECIALTY | 13 | 16 | 25 | 30 | 70 | 32 |
| UTILITY | 61 | 70 | 15 | 92 | 137 | 14 |
| TOTAL PROCESSING | $ 90 | $ 106 | 18% | $ 155 | $ 270 | 21% |
| SOFTWARE PRODUCTS | 27 | 32 | 19 | 45 | 78 | 19 |
| PROFESSIONAL SERVICES | 113 | 127 | 12 | 160 | 222 | 12 |
| TOTAL | $ 230 | $ 265 | 15% | $ 360 | $ 570 | 16% |

($ MILLIONS)

- Lack of sophistication of management has been the drawback to services use:
    - Pressure of responsiveness and reporting, not least from the federal government, will push governments to on-line systems which many will not be able to support internally.
    - Problem with services has been geographic dispersion of targets; however, vendors now have size and coverage to meet these requirements economically.
- EDP-related grants and revenue sharing projects from the federal government have primarily been converted to in-house expenditures; very little has gone to services. This will change in future with federal restrictions.
- Facilities management is still relatively minor in this sector; it will increase in medium-sized governments:
    - Long lead time for sales and conversion.
    - Over intense competition will damage market.
- Scientific and engineering applications will come from engineering departments for modeling and construction support; medical, environmental, and energy use will also contribute expenditures.
- General business expenditures will be for personnel, pension fund accounting, capital goods accounting, budgeting and similar activities primarily in RCS.
- Software products market might be considerably understated in current size:
    - Counties spend $20,000 per year on software purchases, including professional services.
    - Major cities spend $13,000 per year.

- Much software is "shared" in this industry sector; however, support and maintenance then becomes a problem.

- In California, 13 counties have funded a small company to maintain a particular piece of software they all use. This approach to a difficult problem could achieve wide acceptance.

- Professional services is the largest market now and will continue to be through 1982.

  - Government EDP installations will recognize that they cannot satisfy user demand by themselves.

  - Local "image" is almost mandatory except for particular areas such as law enforcement systems.

  - Accounting companies, computer manufacturers, and local small companies dominate this market.

## 4. VENDOR ACTIVITIES

- In the Medicaid area, TCC, Consultec, MCAUTO, OSI, and the accounting companies (notably Touche Ross) have been implementing MMIS for states.

- Computer Sciences Corporation is the leading vendor of services to county governments.

  - Establishes a System Resource Center in each major contract.

  - Collects information, tracks legislation, looks for new opportunities, and helps get federal grant money.

  - Has FM contracts with Pierce and Orange Counties, and with cities of Newark and Cleveland ($2.8 million per year).

  - Also provides money management services; e.g., Montgomery and Prince George's counties in Maryland use MONEY-MAX, an INFONET system which is helping to maximize returns on short-term investments.

- HDR Systems, Inc. is using a CDC 6400 for sanitary landfill management models:

  - Regional Solid Waste Authority, Des Moines, Iowa, is a user.

  - Hennepin County also uses the solid waste model.

- Mathematica (Systems Operations, Inc.) designed and implemented lottery systems in most of the states that have them.

- MCAUTO receives $2 million/year for financial EDP services for L.A. County Department of Health Services.

- Optimum Systems, Inc. has a remote batch system for small municipalities; it has less than 20 clients.

- NCR, Anacomp, and Metridata, all perform large FM contracts for governments in their area. BCS is another prime competitor in its local areas.

## N. SERVICES

### I. INDUSTRY CHARACTERISTICS

- Research and development expenditures in 1977 are expected to reach $43 billion, 13% greater than 1976:
  - Federal funding will be almost $23 billion or 53% of the total.
  - Industrial funding will account for another 44%; non-profit and academic organizations will fund the remainder.
  - R&D will remain the largest industry in this sector through 1981.
- There are over 11,000 R&D institutions in the U.S.
  - 75 centers attached to the government.
  - 12 houses specializing in long-range planning and strategy.
  - 5,000 non-profit research groups.
  - 300 to 500 profit making firms.
  - 4,200 captive industrial R&D centers.
- INPUT includes the 4,200 captive industrial and government centers in their appropriate industry sectors, leaving over 6,000 centers accounting for 50% of R&D revenues in this sector, as shown in Exhibit V-37.
- Architects' commissions will increase by 20% in 1977 as construction rebounds from its doldrums.

EXHIBIT V-37

## SERVICES INDUSTRY SECTOR - DEMOGRAPHIC DATA

| SERVICE | TYPE OF STATISTIC | DATA |
|---|---|---|
| ACCOUNTANTS & CPAs | ESTIMATED REVENUES (1976)<br>PROJECTED REVENUES (1981)<br>NUMBER OF ESTABLISHMENTS | $ 9 BILLION<br>$ 18 BILLION<br>35,000 |
| ARCHITECTS & ENGINEERS | ESTIMATED REVENUES (1976)<br>PROJECTED REVENUES (1981)<br>NUMBER OF ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 18 BILLION<br>$ 30 BILLION<br>25,000<br>300,000 |
| BUSINESS CONSULTANTS | ESTIMATED REVENUES (1976)<br>PROJECTED REVENUES (1981)<br>NUMBER OF FIRMS | $ 14 BILLION<br>$ 31 BILLION<br>23,000 |
| LAWYERS | ESTIMATED REVENUES (1976)<br>PROJECTED REVENUES (1981)<br>NUMBER OF FIRMS | $ 15 BILLION<br>$ 31 BILLION<br>78,000 |
| RESEARCH INSTITUTIONS | ESTIMATED REVENUES (1976<br>PROJECTED REVENUES (1981)<br>NUMBER OF ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 19 BILLION<br>$ 35 BILLION<br>6,000<br>194,000 |

- There are only 70,000 architects in the U.S., compared to 700,000 engineers.

- U.S. consulting engineers have established a world-wide leadership position:

  - Except for the largest firms, the 15 or so with over 500 people in reporting units, consulting engineers tend to be highly specialized.

- Of the $14 billion in consulting, ACME members account for $2 billion, which is growing at 10% per year.

- Accountants are estimated to have over $0.5 billion of consulting revenues which are growing at 20% per year.

  - Some accountants specialize in design and installation of accounting and financial systems.

  - Arthur Andersen obtains 16% of its business from this source.

  - Others do almost anything in the consulting line; Peat Marwick fits this category.

- For all accountants, write-up work averages 43% of their business activity.

  - Small accounting companies have this as the majority of their business in many cases.

  - In this regard, as many as 10,000 of the 35,000 CPA firms have only 1 member.

- "Big 8" accounting companies are increasing the share of their revenues from MAS (management advisory services):

  - Audit contributes 60% to 80% of revenues.

- Tax and financial statement preparation contributes 15% to 25% of revenues.

- MAS contributes 5% to 20% of revenues.

## 2. USE OF EDP

- Automation in professional services is coming:

  - Labor is the largest component of their expenses.

  - Efficiency in the use of labor increases revenues and profits directly.

  - Users will start to demand automated services.

- This last point is critical to the survival of many professional services firms in the long run. If large corporations, for example, discover they can do increasing amounts of legal work themselves through automation, then the base of much independent, corporate, legal activity will shrink rapidly.

- Many professional services firms pass the bulk of EDP costs onto clients directly; thus they act as retailers of services.

- Only 20% of accounting companies use an in-house computer:

  - This is expected to expand to 30% in the next two years.

  - Almost 50% use batch services and this will expand still further.

  - 6% use "timesharing" and this will double in the near future.

- Outside services are generally used for client work. All the "Big 8" companies, for example, have in-house computers for internal work at central offices, while branches buy RCS and batch services independently.

- Accountants fear that small business computers and turnkey systems will reduce their revenue base from financial statement preparation.

- Most law firms with less than 50 attorneys, on the other hand, use no EDP at all:

    - Over 50 attorneys; they generally tend to have an in-house, small computer.

    - Some larger firms are integrating word processing and accounting applications.

    - Very little computer services use, except for billing, in medium-sized (10-15 attorneys) firms.

- Business consultants use outside computer services; few use in-house computers.

    - Payroll and accounting applications are used internally.

    - Specialized services are used depending on their line of business, for example, tabulation and analysis services in market research.

- In all professional services areas, small computers will have a major impact over the next five years through specialized turnkey systems and general purpose systems. In particular, combination word processing and accounting systems will achieve a major penetration in consultants and lawyers.

- As vendors of computer services, accountants are apparently in several conflict of interest situations.

    - They design and install systems which they subsequently have to audit.

    - Accountants, such as Arthur Andersen, are selling software packages and services while auditing their competitors in these markets.

### 3. COMPUTER SERVICES MARKET FORECASTS

- General business processing market, shown in Exhibit V-38, only includes those services purchased by professional services companies for internal use:
  - This is primarily batch payroll and accounting with some RCS based payroll for organizations with widely distributed locations.
  - "Write-up" work performed by accountants for other organizations is counted as expenditures in the industry sectors of those organizations.
  - Rapid growth reflects increasing needs for control, compliance with EEOC, and other regulations, and retirements and pension plans handling.
- Scientific and engineering processing expenditures by architects and engineers (A&Es) will grow from 10% to 15% per year, according to firms interviewed by INPUT:
  - This market is very sensitive to slowdown in the economy, capital investment, and construction.
  - Faster growth could be achieved from "push down" of services to medium and small companies.
  - Some erosion will occur through use of in-house and client computers.
  - Currently over two-thirds of A&E expenditures for EDP go to computer services.
- There is little industry specialized processing for architects and engineers since their projects are so tied-in with activities of other industries.

EXHIBIT V-38

## COMPUTER SERVICES MARKET FORECAST FOR SERVICES INDUSTRIES, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| PROCESSING SERVICES | | | | | | |
| GENERAL BUSINESS | $ 16 | $ 20 | 25% | $ 30 | $ 60 | 26% |
| SCIENTIFIC & ENGINEERING | 72 | 83 | 15 | 105 | 143 | 12 |
| INDUSTRY SPECIALTY | 113 | 132 | 20 | 200 | 350 | 21 |
| UTILITY | 33 | 40 | 20 | 55 | 92 | 18 |
| TOTAL PROCESSING | $ 234 | $ 275 | 18% | $ 390 | $ 645 | 18% |
| SOFTWARE PRODUCTS | 19 | 22 | 18 | 33 | 51 | 18 |
| PROFESSIONAL SERVICES | 8 | 9 | 15 | 12 | 19 | 16 |
| TOTAL | $ 261 | $ 306 | 17% | $ 435 | $ 715 | 18% |

($ MILLIONS)

- Structural analysis is the prime component of scientific and engineering processing expenditures, accounting for over one-third of them in this sector:
  - Chemical, petroleum, and nuclear engineering are the next most active categories.
  - Project management, including CPM and PERT support is a major, specialized category.
- Research and development (R&D) organizations are completely different from A&E companies in their use of EDP.
  - Less than 10% of R&D EDP expenditures go to computer services.
  - Federal funding encourages these organizations to purchase equipment.
  - Sensitivity of research leads to in-house EDP activity.
- The largest single service under industry specialty is tax processing.
  - As taxes get more complex, both companies and individuals will increasingly use processing services.
  - Some services companies will "go direct" to the consumer rather than through accounting companies.
  - For example, Tymshare could use its recent acquisition of WSBA to offer tax services to its 6,000,000 credit card holders and thousands of merchants.
- Accountants and law firms will increase their use of processing services at about 25% per year over the next 5 years, whereas, A&E and R&D firms will increase their use by just over 10% per year.

- Financial and organizational modeling for clients will be a major RCS market.

- Accountants will continue to use RCS and batch services as their delivery systems for client services.

- Lawyers' use of processing services probably amounts to little over $10 million in 1976.

    - For vendor revenue comparisons, an equal amount would have to be added for use of litigation and other services by corporations and other organizations not legal firms.

    - Increased pressure on law firms will cause this to grow.

    - Increased competition, represented by new advertising, will be one of the major pressures.

- In software products, two-thirds of the expenditures are by A&E and R&D firms for in-house use.

    - Generally these are for applications packages.

- It is estimated that there are probably 2,000 organizations developing software for engineers.

    - About $12 billion is spent on it annually.

    - 8,000 civil engineering applications programs.

    - 88,000 civil engineers; still only one in three use EDP.

    - Education of engineers is a problem; 27 dialects of FORTRAN don't help!

- Engineering is a growth industry. For example, civil engineering for transportation is growing at over 20% per year.

- INPUT considers the market potential in engineering to still be very large, on the order of billions of dollars:

  - 700,000 engineers by $50,000 per year loaded rate.

  - Efficiency improvements through EDP of over 10% possible.

  - Target market of $3.5 billion.

  - Penetration of services of 25% would produce a $900 million market.

- The growth rates for computer services, particularly processing, are very conservative for architects and engineers.

## 4. VENDOR ACTIVITIES

- Accounting Corporation of America: a 25-year-old firm with 10 offices. Provides general accounting and payroll services for accountants and their clients.

- Aspen Systems Corp. ($4 million subsidiary of American Can Company) offers litigation support services:

  - 25 employees are in EDP litigation support and state legal records.

  - Provides services in remote batch and interactive modes through ASPENSEARCH IV.

  - Turnkey systems including staff of classifiers to work at client site.

- Automatic Data Processing is one of the largest suppliers of bookkeeping services to accountants. However, expenditures for this business are primarily counted in the industry sectors to which users belong; not in the accounting portion of services. This avoids double counting.
  - A&E companies use ADP for general business payroll and accounting applications.
  - Through ADP Network Services, A&E companies receive support for scientific and engineering,and industry specialty processing.
- Boeing Computer Services is a leader in providing RCS to A&E and R&D organizations:
  - CDC-based "Enhanced KRONOS Service," used for nuclear and structural problems.
  - IBM based TSO service supporting structural engineering.
  - Also offers interactive graphics capability with its engineering services.
  - Price/performance of RCS is very favorable compared to other vendors.
- Bowne Timesharing, Inc. offers word processing services to accountants and lawyers, among others.
  - 25% of $6 million revenues is in law.
  - Word processing document preparation and litigation support are main activities.
- Computer Sciences Corporation provides CPAs and consultants with financial planning and other services through INFONET.

  - Provides services to A&E companies as well.

  - Utility and industry specialty processing are prime services offered.

  - Has SDRC (Structural Dynamics Research Corp.) software (mechanical design library) and proprietary data base.

- Comshare is a major supplier of RCS to the services industries:

  - Systematic Computing Systems has 900 clients for tax processing accounting for over $1 million per year.

  - Provides in-firm and client accounting services.

  - Has COMPASS product line which includes AICPA program library.

  - Replacement cost accounting model (Valuation System Consultants).

- Control Data Corporation (CDC) provides services to A&E companies and lawyers; to a lesser extent to accountants.

  - Law Support Group in Minneapolis was formed after 1966-68 IBM litigation.

  - Does market research and consulting in law industry.

  - International services offered through Cybernet for anti-trust, EEOC, stock fraud, patent, and other litigation.

  - PALLAS is the legal service for civil and anti-trust litigation involving large deposition files and multiple law firm access.

  - Tied in with Cybernet, CDC offers a consulting service on government reporting requirements; establishes recordkeeping requirements for compliance with FTC, EPA, and other agency regulations.

  - Service Bureau Company provides general business payroll and accounting services to accountants for internal use and resale, attorneys, and A&E companies.

- CDC leads other vendors to A&Es in the level and quality of its support:

  - Structural analysis is CDC Cybernet's main revenue generator.

  - Recently offered a new product, Unistruc, which is based on Tektronic graphic display terminals.

  - Unistruc uses proprietary finite element analysis programs as the front end to standard structural engineering products.

  - As well as structural engineering, electrical engineering is a major application area, particularly for support of electric power utility needs.

- ExperTax is a relatively new company.

  - Processes 65,000 tax returns.

  - 1,000 individuals pay $37.50 a time, the rest are less expensive.

- General Electric Information Services (GEIS) has agreement with SDRC for provision of structural engineering packages:

  - International network makes it first choice for RCS by multi-national accounting and A&E organizations.

  - "Big 8" accounting companies all have national contracts with GEIS.

  - Over 250 accountants/consultants as clients.

  - Offers AICPA developed systems.

- Informatics has had a Legal Systems Department since 1966.

  - Offered litigation management services since 1974.

  - Provides services to corporate legal departments through software for in-house use (RECON IV) or through IBM based RCS.

  - Regional centers in Washington and San Francisco.

  - Over 100 specialists engaged in full text, abstracted, key worded, and taxonomic data bases.

- Information Systems Design (ISD) is a Univac 1108 RCS vendor:

  - Prime source of engineering services even though small ($5 million).

  - 16 employees dedicated to A&E market.

  - Makes standard structural analysis software available.

- Itel, through general business processing, offers accountants internal and client services for accounting and general ledger activities.

- MCAUTO concentrates on the engineering market:

  - More than 300 people devoted to it, including 190 "consultants" available to clients.

  - One of the largest libraries of engineering software available.

  - Recognized by many A&E users as the leader in software for them.

  - IBM and CDC based remote batch and interactive services.

- MCAUTO's scientific and engineering revenues broken down by category are as follows:
    - Structural engineering, 40%.
    - Chemical engineering, 15%.
    - Civil engineering, 10%.
    - Electric power engineering, 5%
    - Electronic engineering, 5%.
    - Project management, 20%.
    - Other, LP, etc., less than 10%.
- All categories have some use by engineering services companies, but project management and structural engineering are particularly important.
- Mead Data Central offers LEXIS, one of the two most widely used document search and retrieval systems in use for law support:
    - LEXIS is a library which is not updateable by users.
    - Mead and LEXIS have pioneered this market.
    - Annual sales are about $2 million.
- National CSS offers electrical, heating, and structural engineering RCS to A&E companies.
- Optimum Systems, Inc. (OSI) has recently entered the A&E and law office market:

  - Now has over 50 clients.

  - Licensing agreement with Project Software and Development, Inc. for engineering software including I.C. STRUDL, a proprietary version of STRUDL.

  - Also offers a construction information system for financial estimates for construction engineers and architects.

  - OSI also supports litigation activities of legal firms with specialized service. It has achieved a successful start in this market.

- Structural Dynamics Research Corporation (SDRC) is the leading supplier of software for the A&E market.

  - Over $7 million in sales and nearly 150 people, 30% per year growth rate.

  - Over 200 clients including GEIS, CSC, CDC, and Comshare.

  - Emphasizes mechanical rather than structural engineering.

  - Sales force 100% dedicated to A&E market.

- Tymshare is one of the largest vendors of services to accountants.

  - Dynatax and Unitax account for almost $10 million of tax processing.

  - DELTATAX provides income tax planning.

  - Offers AICPA library and has several million dollars of sales to accountants.

- Tymshare offers a variety of engineering services as well as financial planning for A&E companies.

- UCC supports A&E firms with a variety of generalized finite element analysis programs. It specializes in services in support of the petrolem industry and is used by a variety of engineering companies servicing that industry. Its relatively recent addition and subsequent expansion of CDC equipment has helped considerably in this market.

- United Computing Services offers scientific and engineering processing services.

    - A&E firms represent an estimated 15% to 20% of its $25 million in sales.

    - Multiple CDC systems and over 30 offices.

    - Complete range of structural, civil, mechanical, chemical, and electrical engineering packages.

    - Also offers FORESIGHT and FORETAX for planning purposes to accountants as well as to A&E companies and others.

- West Publishing Company provides WESTLAW, a competitor of Mead's LEXIS. Also, fixed data base documents retrieval system for use in legal research.

## O. OTHER INDUSTRIES

### 1. INDUSTRY CHARACTERISTICS

- As shown in Exhibit V-39, this sector contains several large industries, notably construction, agriculture, and real estate.

- Advertising agencies are also included here.

- Advertising is a $30 billion a year business of which about half is handled by agencies.

- Automobile repair and service is a $15 billion business:

    - Revenues often go to automobile dealers and gas stations.

    - Computer services revenues to these organizations have been accounted for in the retail sector.

- Construction industry has a $9 billion backlog.

    - This industry accounts for 10% of the GNP.

    - Multibillion dollar companies such as Bechtel and Fluor have huge overseas contracts.

### 2. USE OF EDP

- Apart from the highly automated advertising agency business, construction is the most advanced user of EDP in this sector.

## EXHIBIT V-39

## OTHER INDUSTRIES SECTOR - DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| ALL | ALL | SALES | $460 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 1.1 MILLION |
| | | NUMBER OF EMPLOYEES | 15.2 MILLION |
| 01-09 | AGRICULTURE, FORESTRY & FISHING | SALES | $101 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 3,600 |
| | | NUMBER OF EMPLOYEES | 476,000 |
| 15-17 | CONSTRUCTION | SALES | $161.1 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 1,100 |
| | | NUMBER OF EMPLOYEES | 5 MILLION |
| 65 | REAL ESTATE | SALES | $ 88.6 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 163,000 |
| | | NUMBER OF EMPLOYEES | 791,000 |
| 66 | COMBINED REAL ESTATE, INSURANCE | SALES | $247 MILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 7,800 |
| | | NUMBER OF EMPLOYEES | 30,000 |
| 70 | HOTELS & OTHER LODGING PLACES | SALES | $ 10.6 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 40,000 |
| | | NUMBER OF EMPLOYEES | 830,000 |
| 72 | PERSONAL SERVICES | SALES | $ 11.99 BILLION |
| | | NO. OF ORGANIZATIONS/ESTABLISHMENTS | 166,200 |
| | | NUMBER OF EMPLOYEES | 920,000 |

## EXHIBIT V-39 (CONT'D)

## OTHER INDUSTRIES SECTOR-

## DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 75 | AUTO REPAIR | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 12.1 MILLION<br>170,000<br>390,000 |
| 76 | MISCELLANEOUS REPAIR | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 6 MILLION<br>150,000<br>230,000 |
| 78 | MOTION PICTURES | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 4.8 MILLION<br>21,500<br>188,000 |
| 79 | RECREATION | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 8.7 MILLION<br>124,000<br>517,000 |
| 83 | SOCIAL SERVICES | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 2.9 BILLION<br>36,000<br>582,000 |
| 84 | MUSEUMS, ETC. | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $150 MILLION<br>800<br>21,000 |
| 86 | MEMBERSHIP ORGANIZATIONS | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 12.2 BILLION<br>130,000<br>1 MILLION |

EXHIBIT V-39 (CONT'D)

OTHER INDUSTRIES SECTOR-

DEMOGRAPHIC DATA

| INDUSTRY SIC | INDUSTRY NAME | TYPE OF STATISTIC | DATA |
|---|---|---|---|
| 89 | MISCELLANEOUS SERVICES | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 7.3 BILLION<br>62,000<br>602,000 |
| 99 | NON-CLASSIFIABLE ESTABLISHMENTS | SALES<br>NO. OF ORGANIZATIONS/ESTABLISHMENTS<br>NUMBER OF EMPLOYEES | $ 4.8 BILLION<br>195,000<br>579,000 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

- In the $10 billion hotel/motel business, only the chains use in-house EDP as a matter of course:
  - Some larger, independent hotels use turnkey systems.
  - Generally hotels/motels are little interested in automation.
  - Reservation, registration, current accounts, are key applications.
  - Night audit has the most cost savings through computer use.
  - Check out/city ledger reduce bad debts.
  - Computer/communications systems with intra-site communications are needed in large hotels.
  - Independent reservation systems have generally not prospered.
  - INRES, a new reservations service is making rapid headway, particularly among independents.
- In agriculture, EDP is provided from a variety of sources:
  - Large agribusinesses use parent company computers.
  - Universities provide data processing facilities, particularly the "agricultural" colleges.
  - Federal government through U.S. Department of Agriculture is a major provider of computer services.
  - County and state government agencies also are in the business.

  - Some large independent farms have their own hardware, usually from IBM.

- Farm management is growing and companies like Doane Agricultural Service, which does $125 million per year managing 1,300 farms, will expand their EDP needs.

- Construction industry use of EDP is for:

  - Project estimate and control.

  - Subcontractor accounting, labor analysis, union reporting, and standard accounting.

  - Prediction and control of costs vitally important.

- Construction companies of any size tend to have large in-house facilities.

## 3. COMPUTER SERVICES MARKET FORECASTS

- As shown in Exhibit V-40, software products will grow fastest in this sector driven by the implementation of turnkey systems and engineering package sales in construction.

- General business services are largely payroll and other services to the decentralized industries in this sector.

- Scientific and engineering services are primarily from the construction industry. There are also significant scientific and engineering related industry specialty services such as feed blending.

EXHIBIT V-40

## COMPUTER SERVICES MARKET FORECAST FOR OTHER INDUSTRIES, 1976 - 1982

| COMPUTER SERVICE | USER EXPENDITURES | | | | | |
|---|---|---|---|---|---|---|
| | 1976 | 1977 | GROWTH 1977/76 % | 1979 | 1982 | AAGR 1977/82 % |
| **PROCESSING SERVICES** | | | | | | |
| GENERAL BUSINESS | $ 53 | $ 60 | 14% | $ 79 | $ 114 | 14% |
| SCIENTIFIC & ENGINEERING | 35 | 40 | 14 | 51 | 76 | 14 |
| INDUSTRY SPECIALTY | 87 | 96 | 10 | 120 | 192 | 14 |
| UTILITY | 45 | 52 | 15 | 70 | 113 | 17 |
| TOTAL PROCESSING | $ 220 | $ 248 | 13% | $ 320 | $ 495 | 14% |
| SOFTWARE PRODUCTS | 21 | 26 | 25 | 40 | 72 | 23 |
| PROFESSIONAL SERVICES | 44 | 49 | 12 | 60 | 83 | 11 |
| TOTAL | $ 285 | $ 323 | 13% | $ 420 | $ 650 | 14% |

($ MILLIONS)

- Overall utility services will grow the fastest among processing services because of the need for rapid problem-solving in several industries:
    - Also, in construction many users are sophisticated and do their own development.
- There are a variety of opportunities in this sector:
    - Unions and membership associations are prime users of computer services. Dues accounting is the primary requirement.
    - Advertising agencies are heavily automated but running into new demands.
    - Real estate, travel agency and other business and personnel services are fragmented. They provide a real opportunity for RCS.
    - Construction provides the largest single opportunity, although its needs have somewhat slowed in the past few years due to the poor economic climate.
    - Agriculture provides an opportunity for specialized RCS but there are too many "free" and subsidized services at the moment which make "for profit" operations difficult.

## 4. VENDOR ACTIVITIES

- The Automated Quill provides construction management software and systems.
- Automatic Data Processing
    - Provides ADP FASTRENTS for real estate management.

  - Leading supplier of services (payroll) to hotel/motel industry.

- Compass Computers provides reservation services to hotels/motels.

- Computer Sciences Corp. has a computer/communications development contract with CP Hotels.

- Computer Usage Corporation ($9 million) bought Scidata which provides services to agribusiness, including a grain analyzing system.

- Comshare offers feed formulation program from Maddy Associates, a Comshare subsidiary.

- MICOR, the Ramada Inns' subsidiary, offers a nationwide reservation network serving over 2,500 properties including five major hotel chains.

- National Data Corp. is the only survivor of the independent reservation networks operating in 1970.

  - Has about $1 million per year from hotel/motel reservations.

  - Supports 15 chains.

- Planning Research Corporation's PRC Realtronics is one of PRC's computer services ventures outside the federal government.

  - It is expanding rapidly.

  - Decentralized nature of service limits speed of growth.

- Construction is serviced by most of the same vendors in the A&E industry:

  - MCAUTO, CDC, UCC, UCS, GEIS all participate strongly in this market.

  - Strong in-house computer departments in large construction companies.

  - Specialized services companies, like Home and Associates, offer construction management services.

- Tymshare with Western 29 provides RCS to the travel agent industry.

# VI. RECONCILIATION OF MARKET FORECAST DIFFERENCES 1976/1977

# VI RECONCILIATION OF MARKET FORECAST DIFFERENCES 1976/1977

## A. BANKING AND FINANCE INDUSTRY SECTOR

- The difference in the processing services market in 1982 between the 1976 and 1977 reports, as shown in Exhibit VI-1, is explained by applying applicable growth rates to the market changes for 1976. An approximation to the 1982 difference of $545 million may be obtained from multiplying the market change for 1976 ($200 million) by AAGR of 17% which gives $515 million.

- The 1976 differences are obtained from a close examination of the constituents of the finance and banking computer services market, as shown in Exhibit VI-2. The data used in the 1977 report have been presented in 1975 values for purposes of comparison.

- The mode of processing used to deliver the services was also analyzed in more detail and Exhibit VI-3 shows the allocation used for the 1977 report.

## B. INSURANCE INDUSTRY SECTOR

- Review of the Medicaid/Medicare insurance industry for the Industry Report on Government Funded Health Insurance resulted in a $20 million increase in the 1976 FM market, as shown in Exhibit VI-4.

EXHIBIT VI-1

## MARKET FORECAST DIFFERENCES - BANKING AND FINANCE INDUSTRY SECTOR

| MARKET SECTOR | 1976 ANNUAL REPORT | | 1977 ANNUAL REPORT | |
|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | 1976 | 1982 |
| PROCESSING SERVICES | $725 | $1,755 | $925 | $2,300 |
| RCS | 260 | | 437 | |
| FM | 200 | | 170 | |
| BATCH | 265 | | 318 | |

($ MILLION)

## EXHIBIT VI-2

## PROCESSING SERVICES EXPENDITURES DISTRIBUTION IN THE BANKING AND FINANCE INDUSTRIES

| MARKET SECTOR | 1975 ANNUAL EXPENDITURES | |
|---|---|---|
| | 1976 ANNUAL REPORT | 1977 ANNUAL REPORT |
| CORRESPONDENT BANKING* | $150 | $280 |
| BANKING FM | 140 | 140 |
| CREDIT UNION PROCESSING | 20 | 20 |
| SAVINGS AND LOAN PROCESSING** | 70 | 90 |
| SECURITIES DATA BASES*** | 80 | 106 |
| BROKERAGE 'BACK-OFFICE' | 40 | 47 |
| 'TIMESHARING' TO BANKS | 60 | 60 |
| OTHER (AS FOLLOWS) | 30 | 72 |
| UTILITY BATCH (COM., ETC.) | | 20 |
| GENERAL BUSINESS (PAYROLL, PERSONNEL BUDGET), RCS | | 12 |
| GENERAL BUSINESS, BATCH | | 10 |
| INDUSTRY SPECIALTY RCS (CASH MNGMNT., PORTFOLIO ANALYSIS PACKAGE, BRANCH SITE PLANNING, ETC.) | | 30 |
| TOTAL | $590 | $815 |

($ MILLION)

* FOR EXPLANATION SEE TEXT OF BANKING AND FINANCE INDUSTRY SECTOR

** CHANGES MADE AS RESULT OF DETAILED ANALYSIS CARRIED OUT FOR 1977 INDUSTRY REPORT ON SAVINGS AND LOANS

*** CHANGES MADE AS RESULT OF DETAILED ANALYSIS CARRIED OUT FOR 1976 INDUSTRY REPORT ON RCS MARKETS FOR ECONOMETRIC AND FINANCIAL DATA BASES

## EXHIBIT VI-3

## ALLOCATION OF MODE OF PROCESSING FOR BANKING AND FINANCE PROCESSING SERVICES MARKETS

(1975 DATA GIVEN FOR CONSISTENCY WITH PREVIOUS TABLES)

| TYPE OF SERVICE | 1975 ANNUAL EXPENDITURES BY MODE OF SERVICE | | | |
|---|---|---|---|---|
| | REMOTE COMPUTING SERVICES | FACILITIES MANAGEMENT | BATCH | TOTAL |
| GENERAL BUSINESS | $ 12 | - | $ 10 | $ 22 |
| INDUSTRY SPECIALTY | | | | |
| CORRESPONDENT BANKING | 80 | - | 200 | 280 |
| STANDARD BANKING FM | - | 100 | - | 100 |
| TRUST DEPARTMENT FM | - | 40 | - | 40 |
| CREDIT UNION | 10 | - | 10 | 20 |
| SAVINGS AND LOAN | 79 | 3 | 8 | 90 |
| SECURITIES DATA BASES | 106 | - | - | 106 |
| BROKERAGE 'BACK OFFICE' | - | 7 | 40 | 47 |
| OTHER SPECIALTY | 30 | - | - | 30 |
| TOTAL | $305 | $150 | $258 | $713 |
| UTILITY | 60 | - | 20 | 80 |
| TOTAL | $377 | $150 | $288 | $815 |

($ MILLION)

EXHIBIT VI-4

## MARKET FORECAST DIFFERENCES - INSURANCE INDUSTRY SECTOR

| MARKET SECTOR | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| FACILITIES MNGMNT. | $150 | $260 | 9% | $170 | $400 | 15% |
| SOFTWARE PRODUCTS | 51 | 110 | 15 | 52 | 150 | 19 |
| TOTAL COMPUTER SERVICES | $389 | $795 | 12% | $417 | $970 | 15% |

($ MILLIONS)

- This analysis also showed that the FM market for these programs will increase rapidly. New FM contracts and the rapid increase in claims volume processed under new contracts contribute to this growth. Thus, the average annual growth rate for FM in the insurance sector has been increased to 15% from 9%.

- Also in this sector, the growth rate for software products was increased from 15% to 19%; this was because of greater expected demand for small computer software for agents, brokers, and satellite offices. Parent insurance companies will themselves be more willing to buy software in new areas, such as investment and variable annuities.

- The total computer services market in this sector is therefore substantially higher, since the Medicaid/Medicare FM market is such a large proportion.

- The growth rate and market size in the 1980s will alter depending on the form of National Health Insurance implemented.

## C. MEDICAL INDUSTRY SECTOR

- The medical industry sector market was divided into industry markets, as shown in Exhibit VI-5.

- The total size of the hospital market is based on analysis of Hospital Financial Management Association statistics which show over 50% of hospitals use computer services for their data processing.

- Allocation of processing mode was also changed for the 1977 Annual Report. Larger hospitals served by MCAUTO, Shared Medical Systems, and others are categorized as Remote Facilities Management because of the nature of the relationship. Also, about 5% of hospitals actually have on-site facilities management.

EXHIBIT VI-5

## MEDICAL INDUSTRY SECTOR PROCESSING SERVICES EXPENDITURES IN 1976

| TYPE OF SERVICE | 1976 EXPENDITURES BY MODE OF SERVICE | | | |
|---|---|---|---|---|
| | RCS | FM | BATCH FM | TOTAL |
| GENERAL BUSINESS | $ 5 | - | $ 15 | $ 20 |
| INDUSTRY SPECIALTY | | | | |
| HOSPITALS AND CLINICS | 73 | 100 | 37 | 210 |
| PROFESSIONAL | - | - | 50 | 50 |
| NURSING HOMES | - | - | 15 | 15 |
| OTHER (HMOs, PSROs, ETC.) | 2 | - | 3 | 5 |
| TOTAL INDUSTRY SPECIALTY | $ 75 | $ 100 | $ 105 | $ 280 |
| SCIENTIFIC AND ENGINEERING | 1 | - | - | 1 |
| UTILITY | 4 | - | 5 | 9 |
| TOTAL PROCESSING | $85 | $100 | $125 | $310 |

($ MILLION)

- The result of this analysis was a significant increase in the processing market size as shown in Exhibit VI-6.

- Because of the new mix the average annual growth rate of the processing services is reduced from 17% to 15%. Since software expenditures remain unchanged, the total industry sector growth rate drops from 18% to 16%.

## D. RETAIL INDUSTRY SECTOR

- The major change in this sector is allowance for the credit inquiry and handling RCS market not properly accounted for in the 1976 Annual Report.

- This market is estimated at $150 million in 1976 with TRW accounting for 66%.

- Since growth rates remain the same, the 1982 market size difference, shown in Exhibit VI-7, is due entirely to this credit market.

## E. WHOLESALE INDUSTRY SECTOR

- Evaluation of the vendors to this sector for the 1977 Industry Report on "Computer Services Markets in the Wholesale Industry" resulted in a shift of $50 million in processing mode from batch to remote computing services, as shown in Exhibit VI-8.

- On-line services in the automobile parts distribution area and services from XCS, Keydata, and Management Horizons are the major components of this RCS market.

- The batch services market may now be understated.

EXHIBIT VI-6

## MARKET FORECAST DIFFERENCES - MEDICAL INDUSTRY SECTOR

| MARKET SECTOR | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| RCS | $ 85 | | | $ 85 | | |
| FM | 25 | | | 100 | | |
| BATCH | 105 | | | 125 | | |
| TOTAL PROCESSING | $215 | $562 | 17% | $310 | $725 | 15% |
| TOTAL MARKET | $270 | $720 | 18% | $365 | $885 | 16% |

($ MILLIONS)

EXHIBIT VI-7

MARKET FORECAST DIFFERENCES -
RETAIL INDUSTRY SECTOR

| MARKET | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| REMOTE COMPUTING SERVICES | $ 65 | | | $182 | | |
| TOTAL PROCESSING | $197 | $449 | 15% | $315 | $730 | 15% |
| TOTAL MARKET | $255 | $667 | 17% | $375 | $950 | 17% |

($ MILLIONS)

EXHIBIT VI-8

## MARKET FORECAST DIFFERENCES - WHOLESALE INDUSTRY SECTOR

| MARKET | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| REMOTE COMPUTING SERVICES | $ 50 | | | $102 | | |
| BATCH | 230 | | | 180 | | |
| TOTAL PROCESSING | $280 | $594 | 12% | $280 | $614 | 12% |
| TOTAL MARKET | $377 | $809 | 14% | $380 | $830 | 14% |

($ MILLIONS)

## F. SERVICES INDUSTRY SECTOR

- As a result of the industry report, "Computer Services Markets for Architects, Engineers, and R&D Organizations," $40 million of batch business was switched from batch to RCS mode, as shown in Exhibit VI-9.

- Also, services to A&Es were found to be growing much more slowly than those to accountants and lawyers. Hence, the growth rates for processing and total market have been adjusted downward, together with 1982 market forecasts.

## G. OTHER INDUSTRIES SECTOR

- The 1976 Annual Report did not include allowance for scientific and engineering remote computing and batch services purchased by major construction companies such as Bechtel.

- Inclusion of these expenditures, estimated at $40 million in 1976, resulted in the market differences shown in Exhibit VI-10.

## H. REMOTE COMPUTING SERVICES

- In Transportation, airlines spent more for new services, primarily from other airlines, because of increased demand and continued fuel and equipment pressures.

- New evaluation shifted $15 million batch expenditures for Utilities to RCS, primarily in scientific and engineering processing.

## EXHIBIT VI-9

## MARKET FORECAST DIFFERENCES - SERVICES INDUSTRY SECTOR

| MARKET | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| REMOTE COMPUTING SERVICES | $ 90 | | | $131 | | |
| BATCH SERVICES | 140 | | | 103 | | |
| TOTAL PROCESSING | $230 | $726 | 21% | $234 | $645 | 18% |
| TOTAL MARKET | $257 | $793 | 21% | $261 | $715 | 18% |

($ MILLIONS)

EXHIBIT VI-10

## MARKET FORECAST DIFFERENCES - OTHER INDUSTRIES SECTOR

| MARKET | 1976 ANNUAL REPORT | | | 1977 ANNUAL REPORT | | |
|---|---|---|---|---|---|---|
| | 1976 | PROJECTED 1982 | AAGR | 1976 | 1982 | AAGR |
| REMOTE COMPUTING SERVICES | $ 50 | | | $ 73 | | |
| FACILITIES MNGMNT. | 9 | | | 9 | | |
| BATCH | 125 | | | 138 | | |
| TOTAL PROCESSING | $184 | $405 | 14% | $220 | $495 | 14% |
| TOTAL | $249 | $559 | 14% | $285 | $650 | 14% |

($ MILLIONS)

- Federal Government: GSA reported a major increase in RCS expenditures. Better counting on its part contributed to this "growth." INPUT figures have been adjusted upward $20 million as a result.

- Differences in RCS markets in other industry sectors are explained in the industry sector discussions above.

- The result of the adjustments is a 1976 RCS market of $1.8 billion compared to the $1.4 billion projected from last year.

- This $445 million increase is attributed to vendors as follows:

  - Vendors not previously considered, such as banks, engineering service companies, and government contractors ($140 million in 1976).

  - Vendors not analyzed sufficiently previously, such as TRW and DRI ($145 million).

  - Conversion of batch revenues to RCS, particularly for vendors to savings and loan associations, and architects and engineers ($100 million).

  - "New" indentified revenues to known RCS vendor base ($60 million).

## I. FACILITIES MANAGEMENT

- In process manufacturing, the FM market was increased to account for National Data's existing contract with Atlantic Richfield ($14 million per year) for credit card processing, On-Line Systems' timesharing FM contract with ALCOA, and other known FM contracts.

- All other adjustments are covered by industry sector discussions.

- The approximately $100 million increase in FM revenues for 1976 over last year's projections is primarily attributed to:

    - Increase in health insurance FM ($20 million).

    - Redefinition of some medical processing services as RFM (remote FM) from RCS ($75 million).

## J. OVERALL MARKET DIFFERENCES

- Differences between the 1976 and 1977 Annual Reports for the computer services markets are most severe in industry specialty and utility processing, as shown in Exhibit VI-11.

- Most of the difference in industry specialty in 1976 is accounted for by the $500 million added to the market in this year's report for the items mentioned above in the industry sector reconciliation discussion.

- Other differences come from the method of approach.

    - In 1976 each of the modes of processing was analyzed to determine size of the markets by type of service.

    - In 1977 each industry sector was analyzed to determine the size of the markets by type of service.

- Since type of service is more closely related to industry serviced than mode, the second method is more accurate and has led to the changes discussed above.

EXHIBIT VI-11

## RECONCILIATION OF COMPUTER SERVICES MARKET FORECASTS BY TYPE OF SERVICE, 1976 - 1982

| COMPUTER SERVICE | REPORT YEAR | USER EXPENDITURES 1976 | 1982 | AAGR 1976/82 % |
|---|---|---|---|---|
| PROCESSING SERVICES | | | | |
| GENERAL BUSINESS | 1976<br>1977 | $ 750<br>630 | $ 1,875<br>1,400 | 16%<br>14 |
| SCIENTIFIC ENGINEERING | 1976<br>1977 | 420<br>410 | 745<br>810 | 10<br>12 |
| INDUSTRY SPECIALTY | 1976<br>1977 | 1,440<br>2,240 | 4,070<br>5,720 | 19<br>17 |
| UTILITY | 1976<br>1977 | 1,120<br>960 | 2,355<br>2,250 | 14<br>15 |
| TOTAL PROCESSING | 1976<br>1977 | $3,730<br>4,240 | $ 9,045<br>10,180 | 16%<br>16 |
| SOFTWARE PRODUCTS | 1976<br>1977 | 620<br>625 | 1,850<br>1,920 | 21<br>21 |
| PROFESSIONAL SERVICES | 1976<br>1977 | 1,050<br>1,050 | 2,225<br>2,225 | 13<br>13 |
| TOTAL | 1976<br>1977 | $5,400<br>5,910 | $13,120<br>14,320 | 16%<br>16 |

($ MILLIONS)

- The 1982 differences result from the additional markets included (which happen to grow, on average, at the industry rate of 16%) and the different bases used for each mode in 1976.

- Increases in the RCS market, shown in Exhibit VI-12, are in relatively slow growth areas. Hence, the average annual growth rate is reduced.

- Facilities management has increased in the medical and insurance sectors; in medical, it is primarily a reassignment of revenues from RCS, while in Insurance the increase is from Medicaid/Medicare.

- The 1982 market figures and growth rates are included here for comparison purposes only. By 1982, distinguishing services by mode is difficult and meaningless.

EXHIBIT VI-12

# RECONCILIATION OF PROCESSING SERVICES MARKET FORECASTS BY MODE OF SERVICE, 1976 - 1982

| MODE OF SERVICE | YEAR OF REPORT | USER EXPENDITURES | | |
|---|---|---|---|---|
| | | 1976 | 1982 | AAGR |
| REMOTE COMPUTING SERVICES | 1976<br>1977 | $1,400<br>1,845 | $ 4,600<br>5,680 | 23%<br>21 |
| FACILITIES MANAGEMENT | 1976<br>1977 | 720<br>810 | 1,645<br>2,125 | 15<br>17 |
| BATCH SERVICES | 1976<br>1977 | 1,610<br>1,580 | 2,800<br>2,370 | 10<br>7 |
| TOTAL PROCESSING SERVICES | 1976<br>1977 | $3,730<br>4,240 | $ 9,045<br>10,180 | 16%<br>16 |

($ MILLIONS)